548

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 1825–2101

Vol. 46 AUGUST, 1943 No. 548

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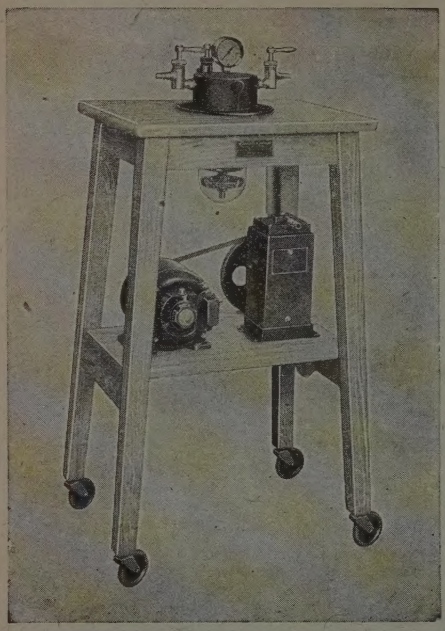

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Erratum: Abstr. 1508, line 2: *for* Novotny, *read* Nowotny.

VARIOUS SUBJECTS

See Abstr. 2089 016 : 551.5

1825 16 : 51

On disjunction in intuitionist logic. VAIDYANATHASWAMY, R. *Proc. Indian Acad. Sci. A*, 17, *pp.* 41–45, *Feb.*, 1943.

MATHEMATICS

See Abstr. 1825 51 : 16

1826 511.28

On $\sigma_{-1}(n)$ and $\phi(n)$. PILLAI, S. S. *Proc. Indian Acad. Sci. A*, 17, *pp.* 67–70, *March*, 1943.

1827 511.4 : 513.11

Lattice points in a right-angled triangle. II–III. PILLAI, S. S. *Proc. Indian Acad. Sci. A*, 17, *pp.* 58–65, *Feb.*, 1943.—[See Abstr. 1437 (1942)].

1828 511.7

A note on Vinogradow numbers. RAO, K. S., AND NAGABHUSHANAM, K. *Proc. Indian Acad. Sci. A*, 17, *pp.* 71–74, *March*, 1943.

1829 511.92

The product of any two demlo-numbers. An approach to the general theory. CHANDRATREYA, M. L., AND KAPREKAR, D. R. *J. Univ. Bombay*, 11, *pp.* 24–28, *March*, 1943.

1830 512.35

The evaluation of the complex roots of algebraic equations. CORNOCK, A. F., AND HUGHES, J. M. *Phil. Mag.*, 34, *pp.* 314–320, *May*, 1943.—The roots are evaluated directly from the original equation by a process akin to Horner's method for real roots.

1831 512.83

The monomial expansion of determinantal symmetric functions. AITKEN, A. C. *Proc. Roy. Soc. Edinb. A*, 61, 3, *pp.* 300–310, 1943.

See Abstr. 2062 512.831 : 548.1

See Abstr. 1827 513.11 : 511.4

1832 513.348

On the cellular division of space with minimum area. LIFSHITZ, J. *Science*, 97, *p.* 268, *March* 19, 1943.

1833 517.393

On some applications of the Tchebycheff inequality for definite integrals. SHOHAT, J. A., AND BUSHKOVITCH, A. V. *J. Math. Phys.*, 21, *pp.* 211–217, *Dec.*, 1942.

1834 517.521.2

Note on a particular test for convergence. ANANTHACHAR, V. S. *Curr. Sci.*, 12, *p.* 18, *Jan.*, 1943.

1835 517.65

A note on a definite integral. SWAMINARAYAN, J. C. *J. Univ. Bombay*, 11, *pp.* 1–2, *March*, 1943.—Evaluation of $u = \int_0^\infty \frac{\tan^{-1}\alpha^2 t^2}{1+t^2} dt$.

1836 517.941 : 518.5

A note on the integration of linear second-order differential equations by means of punched cards. KORMES, M. *Rev. Sci. Instrum.*, 14, *p.* 118, *April*, 1943.—[See Abstr. 2247 (1941)].

1837 517.941.1

Linear differential equations with two-term recurrence formulae. SCHEFFÉ, H. *J. Math. Phys.*, 21, *pp.* 240–249, *Dec.*, 1942.

1838 517.942.6

On the function $H(m, a, x) = \exp(-ix)F(m+1-ia, 2m+2; 2ix)$. LOWAN, A. N., AND HORENSTEIN, W. *J. Math. Phys.*, 21, *pp.* 264–283, *Dec.*, 1942.

1839 517.948.32

A numerical method of solving integral equations in two independent variables. MAGNUSSON, P. C. *J. Math. Phys.*, 21, *pp.* 250–263, *Dec.*, 1942.

1840 517.949.2

The linear theory of neuron networks: the dynamic problem. PITTS, W. *Bull. Math. Biophys.*, 5, *pp.* 23–31, *March*, 1943.—The development of a general theory of neuron-networks is extended to cases of non-steady-stage activity. Conditions for stability and neutrality of an equilibrium point are set up, and the possible functions repr. the variation of excitation over time are enumerated. The inverse network problem is considered. A canonical form for neuron networks is derived, in the sense of a network of a certain special topological structure which is equivalent in activity characteristics to any given network.

See Abstr. 2028 518.4 : 541.123.7

See Abstr. 1836 518.5 : 517.941

1841 519.24

Studies in educational statistics. V. Matriculation examination 1941—University of Bombay. VI. Ranking of high schools by the method of adjusted plot yields. KULKARNI, N. R. *J. Univ. Bombay*, 11, *pp.* 31–51, *March*, 1943.

1842 519.241

Simplified method of utilizing the single-mean "t" test. MUMFORD, A. H. *P.O. Elect. Engrs' J.*, 36, *pp.* 18–19, *April*, 1943.

1843 519.283

On problems connected with item selection and test construction. LAWLEY, D. N. *Proc. Roy. Soc. Edinb. A*, 61, *pp.* 273–287, 1943.—A formula is adopted which gives the probability of an individual of given ability passing a test item in terms of 2 quantities const. for that item. A method of estimating these constants is given. Making certain assumptions concerning the items composing a test, formulae are derived giving the expected value and the std. error of the test score of any person. There is a certain reciprocity betw. persons and items, and corresp. formulae are given for the item scores. Finally, the results are applied to actual data obtained on a Moray House intelligence test, an estimate being made of the reliability of the test.

1844 519.283 : 621.317.331 : 620.19

The use of statistical control in corrosion and contact-resistance studies. CAMPBELL, W. E. *Trans. Electrochem. Soc.*, 81, *pp.* 377–390, 1942.—[Abstr. 1659 B (1943)].

1845 519.41

Normal co-ordinates of symmetric point groups. VENKATARAYUDU, T. *Proc. Indian Acad. Sci. A*, 17, *pp.* 50–54, *Feb.*, 1943.

1846 519.44

Normal co-ordinates of symmetric point groups. II. VENKATARAYUDU, T. *Proc. Indian Acad. Sci. A*, 17, *pp.* 75–78, *March*, 1943.

1847 519.44

The character table of a subgroup of the symmetric group of degree 8. VENKATARAYUDU, T. *Proc. Indian Acad. Sci. A*, 17, *pp.* 79–82, *March*, 1943.

1848 519.45

Possible groups of automorphisms. MILLER, G. A. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 49–54, *Feb.*, 1943.

ASTRONOMY. GEODESY

1849 521.11

Dynamical friction. I. General considerations: the coefficient of dynamical friction. II. The rate of escape of stars from clusters and the evidence for the operation of dynamical friction. CHANDRASEKHAR, S. *Astrophys. J.*, 97, *pp.* 255–273, *March*, 1943.—It is shown that a star must experience dynamical friction, i.e. it must suffer from a systematic tendency to be decelerated in the direction of its motion. This is one of the direct consequences of the fluctuating force acting on a star due to the varying complexion of the near neighbours. The coeff. of dynamical friction, η, must be of the order of the reciprocal of the time of relaxation of the system. An independent discussion based on the 2-body approx. for stellar encounters leads to an explicit formula for the coeff. The formula is in agreement with the conclusions reached on the basis of general considerations.—A general method is described for determining the rate of escape of stars from galactic and globular clusters, based on statistical principles. The rate of escape is evaluated, (1) ignoring dynamical friction and (2) making due allowance for it. It is concluded that in the existence of galactic clusters we can look for direct evidence for the operation of dynamical friction.

1850 522.1

Mount Wilson Observatory Report. ADAMS, W. S. *Carnegie Instn Yearb.*, 41, *pp.* 3–24, 1941–1942.

1851 522.1

Astronomical studies at the Leander McCormick Observatory. MITCHELL, S. A. *Carnegie Instn Yearb.*, 41, *pp.* 26–28, 1941–1942.

See Abstr. 2091 523.745 : 551.510.535 : 621.396.821

1852 523.746

Provisional sunspot-numbers for October to December, 1942, and January, 1943. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 48, *p.* 28, *March*, 1943.

See Abstr. 2074 523.746 : 550.384

See Abstr. 2093 523.746 : 551.543.1

See Abstr. 2098 523.752 : 551.594.5

1853 523.755

Photometry of the inner corona. WALDMEIER, M. *Z. Astrophys.*, 22, *pp.* 18–29, 1942.—The results of photometric measurements made on a short-exposure photograph of the inner corona taken at the 1905 eclipse are shown in the form of isophotes. The ellipticity of the isophotes at the limb reaches 0·047, which is 4 or 5 times the previously accepted value. Between 1′ and 5′ from the limb the intensity I falls off nearly exponentially with height h, the gradient $a = -d(\log I)/dh$ lying betw. 0·20 and 0·27. The max. gradient, as in λ5 303, occurs at about $h = 2'$; nearer the limb a decreases. The zonal structure is not a prominent feature in the continuum, the greatest intensity over the spot zones being only twice that at the poles, as compared with 20 times in λ5 303. The inner corona is regarded as comprising a mixture of electrons and ions, the electrons, by scattering sunlight, giving rise to the spherical "permanent" coronal continuum. Over the spot zones and the C-regions, ultra-violet radiation or corpuscular bombardment produces extremely high ionization which results in the emission of the forbidden coronal lines and strengthens the continuum by increasing the electron density. A. HU.

1854 523.755

Monochromatic photometry of the solar corona. WALDMEIER, M. *Z. Astrophys.*, 22, *pp.* 1–17, 1942.—From 23 spectrograms taken through the Arosa coronagraph with the slit first tangential to the solar limb and then at increasing distances away, isophotes showing the distribution of coronal intensity in λ5 303 are constructed for 3 days in March, 1942. The total intensity of the line was measured at 76 points. The zonal structure shown in the inner corona, with max. at the spot zones ($\pm$ 10°) and min. at the equator and poles, disappears further from the limb, i.e. the radial decrease of intensity is faster in the intense streamers than elsewhere. The measured intensities agree well with visual estimates [Abstr. 1206 (1942)]. Comparison betw. the monochromatic distribution and the distribution found in the continuous spectrum from eclipse photographs is complicated by the fact that the latter usually refer to the outer corona; but the indications are that in λ5 303 the intensity variations, whether along the limb or at rt. angles to it, are more marked than in the continuum. A. HU.

1855 523.841.11

Nova Ophiuchi of 1604 as a supernova. BAADE, W. *Astrophys. J.*, 97, *pp.* 119–127, *March*, 1943.—The light-curve shows that the star was a supernova of type I, which at max. reached the app. magnitude $-2{\cdot}2$. A check of the Chinese version of the apparition against the light-curve shows that the Chinese reports about new stars were based on careful observations. A search for the remnant of the supernova led to the discovery of a small patch of emission nebulosity, which is undoubtedly a part of the masses ejected during the outburst.

1856 523.841.9.035.92

The variable star S Doradus as an eclipsing binary. GAPOSCHKIN, S. *Astrophys. J.*, 97, *pp.* 166–179, *March*, 1943.—On the basis of 1120 photogr. plates in the Harvard collection a light-curve of S Doradus has been derived. The light-curve can be interpreted as that of an eclipsing star with a period of 40·2 years. Four min. are observed. In addition, secondary fluctuations appear. The eclipse lasts over 3 years. Calculations based on the light-curve, an adopted bolometric correction, and the known modulus of the

Large Magellanic Cloud, lead to masses of 60 and 55 ⊙ and radii of 1 400 and 1 260 ⊙. By the use of a method, valid for normal eclipsing stars, radii of 2 100 and 1 900 ⊙ are deduced, masses of 160 and 145 ⊙, and abs. bolometric magnitudes of −12·7 and −12·5.

1857 523.841.9.035.92

Note on Algol. LUYTEN, W. J. *Astrophys. J.*, 97, *p.* 274, *March*, 1943.—[See Abstr. 557 (1943)].

1858 523.851

The galactic clusters NGC 2126 and NGC 2194. CUFFEY, J. *Astrophys. J.*, 97, *pp.* 93–97, *March*, 1943.—The galactic clusters NGC 2126 and NGC 2194 are examined photometrically, and the rel. betw. red colour indices and app. magnitude are obtained. In the case of NGC 2126 a well defined main sequence and a giant branch containing red stars are in evidence. New values for its distance and colour excess are 950 parsecs and 0·8 mag. NGC 2194 has a poorly defined main sequence and a group of giants whose abs. magnitudes appear to be a magnitude fainter than usual. For NGC 2194 the distance and colour excess estimates are 1 200 parsecs and 0·9 mag. The average star densities in the clusters are high.

1859 523.852.32

The direction of rotation in spiral nebulae. HUBBLE, E. *Astrophys. J.*, 97, *pp.* 112–118, *March*, 1943.—Fifteen spirals are now available for which the sense of the spiral pattern and the sense of the spectrographic rotation are known and in which there is conspicuous dissymmetry of obscuration with resp. to the major axes of the projected images. On the assumption that dissymmetry of obscuration is a reliable criterion of tilt, all 15 spirals are rotating in the same direction with resp. to the spiral patterns. In NGC 3190, 4216, 4258 and 4527, the nearer side and the actual direction of rotation are unambiguously determined by dark lanes silhouetted against the nuclear bulges. The results justify the hypothesis that the arms are trailing in all spirals.

1860 523.892.1

Programme for the determination of systematic corrections to fundamental catalogues from observations of minor planets. BROUWER, D. *Carnegie Instn Yearb.*, 41, *p.* 25, 1941–1942.

PHYSICS: GENERAL

1861 53 : 678

Applications and unusual physical properties of synthetic rubbers. COLE, O. D. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 15–20, *Jan.*, 1943.—[Abstr. 1805 B (1943)].

1862 53.081.6

The probable accuracy of the general physical constants. BENFORD, F. *Phys. Rev.*, 63, *p.* 212, *March* 1 *and* 15, 1943.

1863 53.081.6

Comments on "The probable accuracy of the general physical constants." BIRGE, R. T. *Phys. Rev.*, 63, *p.* 213, *March* 1 *and* 15, 1943.

1864 530.12

On the equation of motion of a free particle in the expanding universe of kinematical relativity. MILNE, E. A. *Proc. Roy. Soc. Edinb. A*, 61, *pp.* 288–297, 1943.—A criticism of McVittie's treatment of kinematical relativity [Abstr. 349 (1943)] consisting of the assertion that he prescribes the velocity function of a free particle to be $y = \text{const.}\ x$ and then shows that its acceleration = 0 when the time co-ordinate is transformed. The remainder of the paper is a restatement of Milne's method of discussing the theory of the motion of free particles in kinematical relativity. G. C. McV.

1865 530.12

Axiomatic treatment of kinematical relativity: a reply to G. C. McVittie. WHITROW, G. J. *Proc. Roy. Soc. Edinb. A*, 61, *pp.* 298–299, 1943.—The assertion is made that the axioms considered by McVittie [Abstr. 349 (1943)] are not the basis of kinematical relativity. G. C. McV.

See Abstr. 1901 530.145.6 : 533.7

1866 530.145.63

Systematics of meson matrices. SCHRÖDINGER, E. *Proc. Roy. Irish Acad. A*, 49, 2, *pp.* 29–42, *April*, 1943.—A mathematical paper in which an attempt is made to bring the charge-spin matrices of spin 0 and 1 into a simple scheme. A. J. M.

1867 531.114

Coriolis theorem. BLOCH, A. *Engineering*, 155, *pp.* 243–244, *March* 26, 1943.—Deals with the motion of a body with resp. to a frame of reference which is itself moving with resp. to a main frame of reference. If the velocity and acceleration of a mass point rel. to the auxiliary frame are known, the acceleration with resp. to the main frame requires the addition of the Coriolis acceleration. This is explained by an elementary method. The Coriolis force is also considered, and 2 cases in which the earth's rotation is involved are those of the gyroscopic compass and the flying projectile. In the latter case the deflection of the projectile is caused by a force about 1% of the gravitational force. The force is large in an aircraft engine (Gnome) with cylinders rotating at 1 200 r.p.m. and 1 kg. mass of piston gives rise to a side thrust of 190 kg.; at double the speed the Coriolis force is 4 times as great. G. E. A.

1868 531.19

Memorial to the classical statistics. DARROW, K. K. *Bell Syst. Techn. J.*, 22, *pp.* 108–135, *Jan.*, 1943.—A discussion of the fundamental concepts of statistical mechanics.

1869 531.225

The torsion of a rolled-steel-joist section by relaxation methods. SHAW, F. S., JR. *J. Instn Engrs Aust.*, 14, *pp.* 273–277, *Dec.*, 1942.—A short description of the relaxation method [Abstr. 4776 (1938)] is given in which the differential equation of the stress function is replaced by a finite number of simultaneous equations for points distributed over the section. The section selected was the 10 in. × 5 in. × 30 lb. joist, and diagrams show the values and contours of the stresses as determined by the method. The torsion const. is found. The appendix deals with small "stars" near a curved boundary, and with the deg. of accuracy obtained by the method. G. E. A.

See Abstr. 1902 531.71 : 541.18 : 533.723 = 3

1870 531.718 : 621.317.39

Electric gauges. KUEHNI, H. P. *Gen. Elect. Rev.*, 45, *pp.* 533–536, *Sept.*, 1942.—[Abstr. 1730 B (1943)].

1871 531.72 : 541.183 = 3

On the applicability of the radioactive-indicator method for determining the surface of solid bodies. I. IMRE, L. *Kolloid Z.*, 99, *pp.* 147–157, *May*, 1942.—[See Abstr. 607 (1942)]. Adsorption processes at the boundary betw. solid and liquid phases are investigated and a relation is shown to exist betw. adsorption energy and solution energy of the adsorptive compound. The statistical significance of adsorption vol. and number of adsorption spots is discussed. A generalization is given of Paneth's equation for permutoidal adsorption, explaining exp. results. R. N.

1872 531.756

Determination of specific gravity of dry paint pigments. BAKER, I., AND MARTIN, G. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *p.* 279, *April* 15, 1943.

1873 531.776

Stroboscopic equipment. WINDRED, G. *Engineering*, 155, *pp.* 401–402, *May* 21, 1943.—Ref. particularly to the Strobotac and Strobolux equipments, manufactured by the General Radio Co. E. R. A.

1874 531.783

New methods of measuring small friction torques. *Gemmologist*, 31, *pp.* 33–34, *June*, 1943.—In the case of conical pivot bearings the retardation method is used. A cord is wound round the shaft carrying a flywheel, the other end of the cord being loaded by a weight. The falling weight sets the shaft in rotation. The flywheel causes re-winding of the cord after the weight has reached its lowest position. The diff. heights of the weight, originally and after the test, computes the friction torque.

1875 531.787

A mercury-balance pressure regulator. BAILEY, A. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 283–284, *April* 15, 1943.

1876 531.787

Accurate low-pressure gauge. GERMANN, F. E. E., AND GAGOS, K. A. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 285–286, *April* 15, 1943.

1877 531.787.7

Some notes on practical fluid metering. II. LINFORD, A. *Iron and Steel*, *pp.* 283–286, *April*, 1943.—[See Abstr. 1342 (1943)].—Methods are suggested for overcoming the sooting-up problem and for preventing the entry of dirty gases into the pressure piping and registering element. A description of a steam meter for a rolling-mill is given and means of overcoming errors in the measurement of steam when there are violent pulsations present are mentioned. M.-V.

1878 532.13 : 541.18 = 3

On the most suitable representation of viscosity, especially of colloids. PHILIPOFF, W. *Kolloid Z.*, 98, *pp.* 90–92, *Jan.*, 1942.—It is proposed to name the viscosimetric characteristic value for a dissolved substance, $K = (d\eta_{rel}/dc)_{c\to 0}$, the viscosity const. η_{rel} is the ratio of the viscosities of solution and solvent, c the conc. R. N.

1879 532.133

Viscosity measurement and viscosity index. CRAGG, J. C., AND EVANS, E. A. *J. Inst. Petrol*, 29, *pp.* 99–123, *April*, 1943.—The viscosity/temperature characteristics of petroleum products are expressed in terms of an empirical viscosity index (V.I.) calculated from V.I. $= 100(L - U)/(L - H)$, where L and H are viscosities at 100°F. of oils of V.I. = 0 and 100 resp., and U is viscosity at 100°F. of the oil under test, all 3 oils having the same viscosity at 210°F. An examination is made of the deviations in V.I. created by errors in viscosity determinations. A Redwood viscometer is accepted as std. and the viscosity nomogram of the I.P.T. gives the rel. betw. Redwood seconds and kinematic viscosity to 0·5%. Calibration of the viscometer is done by using one or more of the stds., distilled water, 40% and 60% sucrose solutions. From measurements of the same material in different countries it is concluded that there is a definite need for international standardization. Some points raised are: faults of the Redwood viscometer; variation of the calibration const. of a viscometer with time of flow and with change of std.; over-estimation of the usefulness of the V.I.; the most suitable liquids to employ as std., and for the viscometer hot bath. G. E. A.

1880 532.133 : 532.77

Solution viscosities of the amylose components of starch. FOSTER, J. F., AND HIXON, R. M. *J. Amer. Chem. Soc.*, 65, *pp.* 618–622, *April*, 1943.—The viscosity/conc. relationships give evidence that the amyloses are linear polymers. The viscosity limits fall in an inverse order to the potentials at which the amyloses take up iodine from solution. Synthetic starch is anomalous both with resp. to its iodine titration curve and the viscosity/conc. rel. of its solutions.

1881 532.133 : 532.773 : 541.18 = 3

Viscosity as a function of concentration in concentrated solutions. V. HOUWINK, R., AND KLAASSENS, K. H. *Kolloid Z.*, 99, *pp.* 160–171, *May*, 1942.—The hydrodynamic effects of chain and ball formation of stretched molecules are discussed and experimental results are examined with regard to the applicability of the viscosity/concentration formulae [Abstr. 386 (1942)]. A separation of the authors' original formula for 3 different states of concentration is necessary in order to bring it into agreement with exp. results. [See Abstr. 1882 (1943)]. R. N.

1882 532.133 : 532.773 : 541.18 = 3

Viscosity as a function of concentration. VI. On the significance of the viscosimetric "stretching factor." BREDÉE, H. L., AND BOOYS, J. DE. *Kolloid Z.*, 99, *pp.* 171–189, *May*, 1942.—[See Abstr. 1881 (1943)]. The influence of the following factors on the increase of viscosity with increasing conc. is discussed: intermolecular forces betw. dispersed particles, interaction betw. the latter and the molecules of the solvent, electric charges on the particles, hydrodynamic interaction in the field of flow, influence of the temperature on these factors, and polydispersity of the sol. All these factors must be taken into consideration in defining the so-called stretching factor. The relations betw. the latter and the voluminosity are investigated. R. N.

1883 532.137

The rolling-ball viscometer. HUBBARD, R. M., AND BROWN, G. G. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 212–218, *March* 15, 1943.—A study of the system of the inclined tube and rolling ball as

applied to the measurement of viscosity is described. Dimensional analysis was used to derive general relations betw. the variables involved and the simple calibration for the rolling-ball viscometer in the streamline region of fluid flow. The coeff. of the calibration equation may be calculated from the dimensions of the instrument with the aid of an exp. determined factor. An empirical correlation is given which allows viscosity to be estimated from data taken on the viscometer in the turbulent region of fluid flow. The effect of temperature changes on the viscometer and its calibration is discussed.

1884 532.137(09) = 3

On the history of viscometry. HÖPPLER, F. *Kolloid Z.*, 98, *pp.* 1–5, *Jan.*, 1942.—In a water clock designed by Amenemhet for Amenophis I in the 16th century B.C., the dependence of viscosity on temperature was taken into consideration. The amount of water flowing out of the receptacle, and its viscosity, serve as a measure of time while with Engler's viscosimeter amount and time are used for determinining viscosity. R. N.

See Abstr. 2056 532.14 : 532.612 : 541.25

See Abstr. 1935 532.14 : 535.375.5 : 535.323 : 535.338.42

1885 532.517.3 = 4

The instability of a row of vortices near a boundary wall. PATRY, J. *Helv. Phys. Acta*, 16, 1, *pp.* 83–98, 1943.—A mathematical study of the instability of a series of vortices near a boundary wall shows that the approach of a vortex to the boundary can prevent the series from passing the point of approach. A vortex agglomerate giving rise to marked turbulence is produced. If the agglomerate becomes disengaged, the fact that the series has been interrupted leads to a repetition of the phenomenon. Schiller's notion of the origin of turbulence in channels is thus confirmed. J. S. G. T.

1886 532.517.4

The relationship between Reynolds' number and velocity distribution. RHODES, L. S. *J. Appl. Mech.*, 10, *A21–A22, March*, 1943.—It is shown that, for turbulent flow, the velocity distribution in the cross-section of a pipe and the ratio of mean velocity to centre velocity depend upon the rate of variation of the friction factor f, with Reynolds' number N_R.

1887 532.528

Cavitation in an elastic liquid. KENNARD, E. H. *Phys. Rev.*, 63, *pp.* 172–181, *March* 1 *and* 15, 1943.—An idealized theory of cavitation in the interior of a liquid is developed as an extension of the hydrodynamics of irrotational motion. It is assumed that cavitation occurs whenever the pressure sinks to a fixed breaking-pressure and that the pressure then rises at once to a fixed cavity pressure. The boundary of the cavitated region either advances as a breaking-front, moving with ultrasonic velocity, or remains stationary as a free surface, or recedes towards the cavitated region as a closing-front. The relevant formulae are obtained.

1888 532.542.1

Roughness factors in fluid motion through cylindrical pipes and through open channels. ALLEN, J. *J. Inst. Civ. Engrs*, 6, *pp.* 91–108, *April*, 1943.—Results rel. to the dependence of the friction coeff., f, upon various factors deduced from exp. results (Nikuradse, Colebrook and White) in the case of the flow of fluids through cyl. pipes are discussed. An empirical method of calculating f, possibly possessing a rational basis, is derived for the case of flow in a pipe whose surface is partly smooth and partly rough, and has evenly distributed excrescences of 2 different sizes. In the case of flow of fluid through rough open channels, the law connecting Chezy's const., C, with the hydraulic mean depth is of the same nature as that applicable to rough cyl. pipes. J. S. G. T.

See Abstr. 2056 532.612 : 532.14 : 541.25

1889 532.613

Interfacial-tension studies of sodium laurate solutions. DAVIS, J. K., AND BARTELL, F. E. *J. Phys. Chem.*, 47, *pp.* 40–50, *Jan.*, 1943.—The effect of ageing upon the interface betw. aq. Na laurate solutions (at various *p*H values) and *n*-heptane was determined. Equilibrium interfacial tensions of unhydrolysed Na laurate solutions against *n*-heptane were measured. At conc. $> 0{\cdot}005\ N$, the adsorption of Na laurate at the water/heptane interface is comparable to its adsorption at the surface of its aq. solution. The extended decrease with time of the interfacial tensions of partially hydrolysed laurate solutions against *n*-heptane is due to migration of fatty acid across the interface. Addition of lauric acid to *n*-heptane causes interfacial-tension lowerings at the aq. soap-solution/*n*-heptane interfaces which are similar to the interfacial-tension lowerings at the analogous water/*n*-heptane interfaces. In order for aq. Na laurate solutions to attain very low interfacial tensions against a non-polar organic liquid, considerable concentrations both of Na laurate in the aq. phase and of lauric acid in the organic liquid phase must exist, and these concentrations must be in equilibrium.

1890 532.62

Energy relations in film penetration. SCHUBERT, J., AND BOYD, G. E. *J. Chem. Phys.*, 11, *p.* 215, *April*, 1943.

1891 532.62 = 3

Contribution to the knowledge of the structure of liquids in the capillary layer. RĂDULESCU, D. *Kolloid Z.*, 98, *pp.* 34–42, *Jan.*, 1942.—The paucimolecular liquid layer (Abstr. 3164 (1939)] and the possibility of determining the effective cross-section of the molecules from the steps found in the desorption isotherms are discussed. The radii and axes of the spinning molecules, and the thickness of the capillary skin, may be determined. The heterogeneous equilibria at the phase boundaries liquid/gaseous or liquid/solid cannot be represented by simple formulae with only 1 or 2 const. Questions of soil chemistry are briefly discussed. R. N.

1892 532.692 : 539.211

A note on "oiliness" and surface roughness. BIKERMAN, J. J. *J. Soc. Chem. Ind., Lond.*, 62, *pp.* 41–42, *March*, 1943.—An empirical relation betw. the time required to separate 2 plates immersed in a lubricant and the force used for the separation is utilized for estimating the roughness of the contact surfaces of the plates. E. R. A.

See Abstr. 1958 532.7 : 536.71

1893 532.7 : 541.123.2 = 3

Problems and development of a theory of binary systems. FREDENHAGEN, K., AND TRAMITZ, E. *Kolloid Z.*, 99, *pp.* 52–73, *April*, 1942.—Without restricting the considerations to highly diluted solutions, a general account is given of v.p. and its rel. decrease according to Raoult's law, the distribution betw. liquid and gaseous phase, the connections betw. the v.p. curves of the 2 components, the significance and generation of osmotic pressure, the changes in volume and the heats of mixture for binary systems. The conditions are discussed under which statements may be made, based on thermodynamical and kinetic considerations, on changes of the free energies of the mixture and of its components. Physical and chemical phenomena are investigated rel. to dilution, chemical reactions betw. the components, and changes of the intermolecular forces or interior molar energies. [See Abstr. 2498 (1941)]. R. N.

1894 532.71 = 3

On the diaphragm equilibrium. BARBULESCU, N. *Kolloid Z.*, 99, *pp.* 78–85, *April*, 1942.—A generalization is given of Donnan's equilibrium condition for diaphragms. A diaphragm factor, K, is defined, being the ratio of the products of the conc. of the 2 electrolytes at diff. transition velocities. For $K = 1$, Donnan's relation is valid. The displacement of the diffusing electrolyte is $\propto$ the conc. of the non-diffusing electrolyte. The law of equilibrium is applied to gases and solutions of non-electrolytes, and further conclusions are drawn from the generalized law. R. N.

1895 532.72 : 541.182.4 = 3

Diffusion of some soaps in a medium containing salt. LAMM, O. *Kolloid Z.*, 98, *pp.* 45–52, *Jan.*, 1942.—With the method previously described [Abstr. 597 (1942)], and with a novel diffusion apparatus described and illustrated, the conc. function of the diffusion coeff. of K soaps of lauric, caprinic and caprylic acid in a medium containing salt or alkali was determined. Micelle formation was observed in 0·005N solution of the laurate, 0·03N solution of the caprinate and 0·3N solution of the caprylate. Beyond these conc. the diffusion coeff. was independent of conc. The myristate has a much smaller diffusion coeff. This is connected with the decreasing solubility with increasing chain length. [See Abstr. 1404 (1942)]. R. N.

1896 532.73 : 621.357.7

Solubility of nickel ions in aqueous alkaline carbonate-tungstate solutions. HOLT, M. L., AND SWALHEIM, D. A. *Trans. Electrochem. Soc.*, 81, *pp.* 251–265, 1942.—[Abstr. 1756 B (1943)].

See Abstr. 1880 532.77 : 532.133

1897 532.771 : 536.6

Microcalorimetric studies of the thermal properties of dilute solutions. *Carnegie Instn Yearb.*, 41, *pp.* 106–107, 1941–1942.

See Abstr. 1881, 1882 532.773 : 541.18 : 532.133 = 3

1898 532.782 : 536.7 : 541.128 = 3

The disperse structure of solid systems and its thermodynamic foundation. VII. BALAREW, D. *Kolloid Z.*, 99, *pp.* 73–77, *April*, 1942.—[See Abstr. 305 (1943)]. From investigations on the solubility of gypsum or NaCl crystals, and on the reversibility of the effect of catalysers after different heat treatment, 2 further proofs are derived for the thermodynamic foundation of the disperse structure of solid systems. Hints are given for the future development of investigations on regeneration and increase of the catalytic effect. R. N.

1899 532.787

Experiments on germ formation in supersaturated solutions. AMSLER, J. *Helv. Phys. Acta*, 15, 7, *pp.* 699–732, 1942.—Results from experiments on germ formation in supersaturated aqueous solutions of KCl, KBr and KI, and also of KCl in a mixture of alcohol and water, are not in agreement with current theory, and other factors have therefore been sought to account for the divergency. The germ formation was detected by a sudden change of electrical conductivity of the solution. Various degrees of supersaturation have been examined, and it has been found that a limit exists above which crystallization begins within a few min., whereas at small supersaturations long periods may be required. With increasing surface tension of the precipitated crystals with resp. to the solution, this limit is displaced in the direction of increasing supersaturation. The value of the supersaturation at the lim. point may be theoretically calculated in satisfactory accord with the exp. data. A theoretical treatment is included which is based on the new data. H. H. HO.

1900 533.15

Thermal diffusion with ammonia. WATSON, W. W., AND WOERNLEY, D. *Phys. Rev.*, 63, *pp.* 181-184, *March* 1 *and* 15, 1943.—With a 2-bulb thermal diffusion experiment in which is used NH_3 having a 15% N^{15} content to increase the accuracy of the mass spectrometer analyses, it is found that with decreasing temperature the thermal diffusion const., α, of NH_3 changes from + to − values at room temperature. The value of α varies linearly with the log of the abs. temp., the rate of decrease being 8 times that for Ne and A. A qualitative discussion is presented, attributing this effect to the strong first-order dipole-dipole intermolecular forces $\propto$ to $1/R^4$.

1901 533.7 : 530.145.6

Distance correlations and Bose–Einstein condensation. LONDON, F. *J. Chem. Phys.*, 11, *pp.* 203–213, *April*, 1943.—The correlation effect on the mol. distance distribution in a Bose–Einstein gas is calculated as a function of vol. and temp., particularly for the case of degeneracy of the gas. Under certain conditions in the condensed state, the density as seen from any one molecule appears larger than the true density.

1902 533.723 : 541.18 : 531.71 = 3

A compensation method for determining the size of micelles. LAGUARTA, E. M. G. *Kolloid Z.*, 99, *pp.* 85–89, *April*, 1942.—By superposing a uniform translation on a system suitable for observing Brownian movement such that no retrograde movement is observable, the mean square displacement is readily found by experiment. Simple relations exist betw. velocity of flow, Brownian displacement, smallest length resolvable by the observation system, and time of observation. From the m.s. displacement the radius of the micelles is calculated according to the laws of molecular kinetics. R. N.

SOUND. VIBRATIONS

1903 534.1 : 621.43

Harmonic coefficients of engine torque curves. PORTER, F. P. *J. Appl. Mech.*, 10, *A33–A48*, *March*, 1943.—[Abstr. 1803 B (1943)].

1904 534.113 : 621.65

Calculation of load and stroke in oil-well pump rods. LANGER, B. F., AND LAMBERGER, E. H. *J. Appl. Mech.*, 10, *A1–A12*, *March*, 1943.—[Abstr. 1804 B (1943)].

1905 534.13 : 624.5

Oscillations of suspension bridges. REISSNER, H. *J. Appl. Mech.*, 10, *A23–A32*, *March*, 1943.—A system of linear differential equations with variable coefficients is established, taking into account the horizontal displacements and inertia forces, the change of thrust along the cable, the slope of the cable, and the torsional stiffness of the girder. An approx. integration by the Rayleigh energy method is shown and is numerically exemplified for the lowest antisymmetric mode. The problem of self-excited oscillations is treated on the basis of observations, experiments and conclusions in connection with the Tacoma bridge failure. The aerodynamic and structural damping plays an important part in the safety of a suspension bridge. The dangerous oscillations are of higher frequency than the free oscillations, with log. decrement a linear function of the reduced velocity, so that the bridge as a self-exciting mechanism absorbing energy out of a steady wind flow had to be assumed as the cause of the failure.

1906 [534.17 + 534.372] : 621.165

Steam-turbine vibration. *Marine Engr, Lond.*, *pp.* 96–98, *May*, 1943.—[Abstr. 1663 B (1943)].

1907 534.322 : 681.818

An experimental study of the tone quality of the Boehm clarionet. MCGINNIS, C. S., HAWKINS, H., AND SHER, N. *J. Acoust. Soc. Amer.*, 14, *pp.* 228–237, *April*, 1943.

See Abstr. 1906 [534.372 + 534.17] : 621.165

1908 534.836

Acoustics and the quiet train ride. JACK, W. A. *Trans. Amer. Inst. Elect. Engrs, Suppl.*, 61, *pp.* 382–392, *June*, 1942.—Discusses fundamentals of acoustics important in noise reduction and describes instruments for measuring the physical quantities involved. The train problem is analysed, and data for a quiet type of coach are presented. Methods of noise control are discussed. E. R. A.

1909 534.85

Needle armature pick-up. HAY, G. A. *Wireless World*, 49, *pp.* 137–139, *May*, 1943.—By using the needle alone as armature the h.f. resonance can be made well above the audio-range, while the reduction in mass admits lighter pressure on the needle and consequently less record wear. Output voltage is only a few mV, and care is necessary to eliminate magnetic hum. F. T. F.

1910 534.85 : 621.396.625.2

Some recent developments in record-reproducing systems. BEERS, G. L., AND SINNETT, C. M. *Proc.. Inst. Radio Engrs, N.Y.*, 31, *pp.* 138–146, *April*, 1943.—[Abstr. 1794 B (1943)].

OPTICS

1911 535.12

Impact of a wave packet and a reflecting particle. IVES, H. E. *J. Opt. Soc. Amer.*, 33, *pp.* 163–166, *March*, 1943.—The impact of a wave packet and a particle has been studied by Compton, for the sp. case of a light quantum striking an electron. The frequency of the reflected or "scattered" radiation was deduced by Compton along relativistic lines by invoking the laws of conservation of momentum and energy, and introducing the known values of h and m. A general study of the impact of wave trains of definite length, or "packets," on reflecting particles is given, using classical wave theory, and an interesting result is that a derivation of the variation of mass with velocity is obtained, using only the principles of conservation of mass, momentum and energy. A. W.

1912 535.23 : 537.534 = 3

Polarization and intensity asymmetry of canal-ray light. STARK, J. *Phys. Z.*, 43, 9–10, *pp.* 140–145, 1942.—The items considered comprise the reality of the polarization of the canal-ray emission, the longitudinal and transverse polarization of different lines and series, the occurrence of the axial and preponderant one-sided order of the canal-ray atoms, the reality of the intensity asymmetry of the canal-ray emission, the direction of the magnetic moment of the electron and intensity asymmetry, the intensity asymmetry of isomeric forms of the atoms of an element, the consequence of the eddy-like character of the elementary light emission. The electromagnetic field has an axial structure at the surface of an atom in so far as a surface electron executes a spin and, under circumstances, a precessional motion about an axis of an atomic ion (atom residuum) situated opposite to it. The light emission on the part of an individual atom occurs as a light-eddy carrying forth its energy undiminished in a single direction. H. G. S.

1913 535.23 : 537.534 = 3

Intensity asymmetry of the light emission in the axis of the electric field. STARK, J. *Phys. Z.*, 43, 9–10, *pp.* 146–151, 1942.—The intensity rel. of He and of H doublet lines in the transv. effect and the intensity asymmetry of He lines and of H lines in the axis of the electric field are discussed. The H and He atoms are axially oriented in the electric field with excess of anodic over cathodic dispositions. The intensity of the anodic ortho-atoms in the direction opp. to the field is $>$ that of cathodic ortho-atoms in the direction of the field; but the intensity of the anodic para-atoms in the direction of the field is $>$ that of the cathodic para-atoms in the direction opp. to the field. This intensity asymmetry affords a new proof of the eddy-like character of the elementary emission of light energy in a single direction. H. G. S.

1914 535.24 : 628.9

The effectiveness of lighting: its numerical assessment. WRIGHT, W. D., CRAIK, K. J. W., MACPHERSON, S. J., AND STILES, W. S. *Trans. Illum. Engng Soc., Lond.*, 8, *pp.* 43–58, *March*, 1943.—These 4 papers deal with diff. possible methods of evaluating quantitatively the effectiveness, as distinct from the engineering efficiency, of a lighting system. The first deals with subjective brightness measurements [see Abstr. 617 (1941)], the second with methods

based on visual acuity, the third shows that determinations of the rate of blinking are not reliable as a guide, while the fourth describes methods based on threshold determinations. J. W. T. W,

1915 535.24 : 628.9

New methods of calculating illumination. MOON, P. *J. Opt. Soc. Amer.*, 33, *pp.* 115–122, *Feb.*, 1943.—A critical résumé of methods used in illumination calculations. The solid-angle method is applied to both uniform and non-uniform sources. The use of the concept of the light field has been disappointing as regards its results. The calculation of inter-reflections is described. Bibliography. J. W. T. W.

1916 535.241 : 535.345

Measurement of transmission and contrast in optical instruments. MCRAE, D. B. *J. Opt. Soc. Amer.*, 33, *pp.* 229–243, *April*, 1943.—Reviews the literature dealing with methods for measuring the transmission factors of optical instruments, incl. dispersing systems. Sources of error in making such measurements are pointed out, particularly multiple reflections betw. the instrument and part of the measuring system, e.g. an opal glass plate. The effect of "ghosts," due to reflections in the surfaces of the elements of photographic lenses, is to reduce the contrast in the image, even when no spurious images are formed in the image plane. J. W. T. W.

1917 535.242.4

The spectral characteristics of optical wedges. SWEET, M. H. *J. Opt. Soc. Amer.*, 33, *pp.* 194–208, *April*, 1943.—Investigation of the colour density of optical transparency wedges shows that specimens prep. from various photographic emulsions under different conditions exhibit approx. the same colour-density relationship. Such wedges are characterized by a higher red density than blue or green. The construction of a simple photo-electric densitometer which reads contact-printing density directly is described. The spectral transmission properties of photographic and carbon wedges manufactured commercially for use in intensity-scale sensitometers are compared. Contact-printing density measurements of these wedges are made under conditions duplicating sensitometric practice. The results confirm the superior performance predicted for the photographic wedge on the basis of earlier work. A. H.

1918 535.242.43

Slotted cylindrical rotors for photometric calibration. PLATT, J. R., CLARK, H. E., COHEN, A. A., AND CALDWELL, P. A. *Rev. Sci. Instrum.*, 14, *pp.* 85–88, *April*, 1943.—Hollow cyl. rotors with slotted walls can be used as substitutes for sector discs for photometric applications. Designs are given of rotors which can replace a logarithmic sector, fixed sector disc, step sector, and variable sector disc. Some of these rotors may be used with non-parallel light.

1919 535.243

Modification of Cenco spectrophotometer. DUTTON, H. J., AND BAILEY, G. F. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 275–277, *April* 15, 1943.—A modification of the spectrophotometer permits the measurement of reflection and fluorescence spectra with moderate resolution. The arrangement whereby fluorescence is observed from the same direction as the exciting light is superior to other arrangements, in that the shape of the curve representing the spectral distribution of energy and the position of the max. are indep. of conc. of the fluorescing substance.

1920 535.243 : 535.81

The visual spectrophotometry of glasses, with special reference to low-absorptive glasses. WANG, T. H. *J. Soc. Glass Technol.*, 26, *pp.* 254*T*–270*T*, *Dec.*, 1942.—The types of spectrophotometer designed for the measurement of absorption of homogeneous glass are not suitable for the measurement of low absorption. When using a small-sized source of illumination the thickness of the specimen may have to be limited to 0·7 cm. If a broad uniform diffusing source is available, specimens up to 13 cm. thick can be studied. An apparatus constructed on this principle is described and typical results are recorded.

1921 535.243 : 535.81

Some spectrophotometric investigations on iron-oxide-containing soda-lime-silica glasses. I. The influence of concentration and ferric-ferrous dissociation. WANG, T. H., AND TURNER, W. E. S. *J. Soc. Glass Technol.*, 26, *pp.* 272*T*–295*T*, *Dec.*, 1942.—At conc. $< 0{\cdot}6\%$ of Fe_2O_3 a linear relation betw. absorption and deg. of ferric oxide dissociation held approx. true within the range of dissociation of about 13–35%. The ferric iron at low conc. contributes a greenish-yellow colour, whilst ferrous iron bestows a blue colour on the glass. At high conc. the ferric iron exercised high absorption, particularly in the blue-violet end, thus resulting in a brown or pale brown colour. This high absorption component is sensitive to heat treatment.

1922 535.247.4

Studies in filter photometry. SCHWARTZ, M. C., AND MORRIS, L. W. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 20–23, *Jan.* 15, 1943.—Describes the use of a filter photometer with rectifier cell for the colorimetric determination of silica by the silicomolybdic acid reaction. The research was undertaken to investigate the importance of securing isolation of the proper wavelength region. J. W. T. W.

1923 535.247.4

Ultra-violet photometer for analysis of solutions. KLOTZ, I. M. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 277–278, *April* 15, 1943.—Results obtained with phenol, sulphanilamide and KNO_3 are described, and applications to other substances (aromatic compounds) are discussed.

1924 535.314

Conical refraction. MELMORE, S. *Nature, Lond.*, 151, *pp.* 620–621, *May* 29, 1943.—Observations are made regarding the connection betw. the phenomenon of conical refraction and the behaviour of focal lines in biaxial crystals. A. H.

1925 535.321.088

Sources of error in precise commercial refractometry. TILTON, L. W. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 311–329, *April*, 1943.—Exclusive of compensators, the mech. requirements for accurate refractometry are difficult. Optical requirements are high because the symmetrical use of all apertures is not possible. If it is necessary to distinguish betw. index of sample ref. to air at t or at t_0, this usually can be done by choice of a rel. or an abs. temp. coeff. For

an error of 1×10^{-5} in index of solids, the permissible prism of contact liquid is $\frac{1}{3}$ fringe per cm. as viewed in the exit pupil of the telescope. The requirements for min. shielding of critically refracted rays, for absence of certain interference fringes in the field of view, and for surfacing of the illuminating prism are so related with ref. to measurements on small samples of liquid that compromises are necessary in the design of precision refractometers.

1926 535.322.4 : 539.216.1

A fibre refractometer. FREEMAN, K., AND PRESTON, J. M. *J. Text. Inst., Manchr, pp. T19–T28, May*, 1943.—An instrument is described for the rapid determination of the refractive indices of fibres. A single observation gives the mean refr. index of a large number of fibres. Data on the dispersions of the refr. indices are given for 5 cellulose rayons.

See Abstr. 1935. 535.323 : 532.14 : 535.375.5 : 535.338.42

1927 535.33

Research in the spectroscopy of the vacuum ultra-violet. BOYCE, J. C. *Carnegie Instn Yearb.*, 41, *pp.* 107–111, 1941–1942.

1928 535.33.03

Spectrochemical light-source errors and their compensation. GROSSMAN, H. H., SAWYER, R. A., AND VINCENT, H. B. *J. Opt. Soc. Amer.*, 33, *pp.* 185–193, *April*, 1943.—A method is outlined of determining the magnitude of the various random errors of analysis. The light-source error is the controlling one. The results do not bear out the idea that all changes in source conditions produce only a change in source temperature. In the method described, a correlation curve is determined by observations taken during the normal operation of the source and this is used to correct later results. A. H.

1929 535.33.03

A new spectroscopic source unit. HASLER, M. F., AND DIETERT, H. W. *J. Opt. Soc. Amer.*, 33, *pp.* 218–228, *April*, 1943.—Discusses spark and arc characteristics. To investigate these, a special circuit has been developed which charges a condenser to a def. voltage before each breakdown, has the analytical gap in the discharge circuit, so that termination of the discharge dep. only on the circuit and gap constants, and allows of both oscillatory and unidirectional discharges with a wide variety of excitation conditions. A. H.

1930 535.33.03

The carbon arc in oxygen for the spectrochemical determination of potassium. STEADMAN, L. T. *Phys. Rev.*, 63, *p.* 322, *April* 1 *and* 15, *Erratum, p.* 399, *June* 1 *and* 15, 1943.

1931 535.331

Spectrographic studies of minor elements in minerals. NEWHOUSE, W. H. *Carnegie Instn Yearb.*, 41, *pp.* 111–112, 1941–1942.

1932 535.338.3 : 539.153

The spectrum of neutral tungsten, W I. LAPORTE, O., AND MACK, J. E. *Phys. Rev.*, 63, *pp.* 246–297, *April* 1 *and* 15, 1943.—An analysis of the W I spectrum has yielded 300 levels, of which 201 have been given tentative magnetic g values. All the low levels are believed to be known. The ionization potential is $(7{\cdot}94 \pm 0{\cdot}1)$ V. A rectangular array of the transitions is given.

1933 535.338.42

Vibrational frequencies of the isotopic water molecules: equilibria with the isotopic hydrogens. LIBBY, W. F. *J. Chem. Phys.*, 11, *pp.* 101–109, *March*, 1943.—The fundamental frequencies, anharmonicities and vibrational modes for the molecules HDO, HTO, DTO and T_2O are calculated [see Abstr. 1168 (1940)]. The equilibrium constants for 9 equilibria are given. Exp. values for the reactions $HD + H_2O = H_2 + HDO$ and $HT + H_2O = H_2 + HTO$ are compared with those calculated. The vibrational potential function is essentially unaltered by isotopic substitution.

1934 535.338.42

High-multiplicity terms in molecular spectra. MÜLLER, W. *Helv. Phys. Acta*, 16, 1, *pp.* 1–32, 1943.—The spectra of MnCl, MnBr and FeCl were investigated from the conception that the total spin of a molecule is composed of the spin vectors of the sep. atoms, so that molecular terms of high multiplicity may be expected. The diatomic radicals are reinforced by the thermal dissociation of the chem. stable triatomic molecules. The construction and working of the furnace employed are described. The analysis of the ultra-violet band system of MnCl and MnBr indicates $^7\Pi$–$^7\Pi$ transitions whereby 19 band systems have been observed which are possible from the selection rule, of which the (0, 0)-bands are arranged in quadratic multiplet schemes. A new $^4\Pi$–$^4\Sigma$ transition was found with FeCl, wherein the $^4\Pi$-term shows atomic-like splitting. The molecular terms were determined from the terms of the separated atoms and according to the method of molecular orbitals. The observed differences of multiplet splitting are explained from the electronic configurations and force constants of MnCl and FeCl. Analogous spectra are discussed. H. H. HO.

1935 535.338.42 : 535.375.5 : 535.323 : 532.14

Raman spectrum and molecular vibrations of nitric and deuteronitric acids. REDLICH, O., AND NIELSEN, L. E. *J. Amer. Chem. Soc.*, 65, *pp.* 654–660, *April*, 1943.—A new line, 480 cm.$^{-1}$, was found in the Raman spectrum of anhydrous HNO_3 and interpreted as the frequency of the restricted internal rotation of H. Anhydrous deuteronitric acid, free of lower oxides, was prepared and its Raman spectrum determined. All 9 fundamentals were found in the spectra. The results are in accord with the product formula applied to symmetry C_s (plane configuration). The density of deuteronitric acid at 25·00° is $1{\cdot}522_8$. The refractivities of nitric and deuteronitric acids at 25·0° are $n_D = 1{\cdot}3920$ and $n_D = 1{\cdot}3909$, respectively.

1936 535.34-1

The absorption of infra-red radiation by water vapour and carbon dioxide. MCCAIG, M. *Phil. Mag.*, 34, *pp.* 321–341, *May*, 1943.—The total pressure was varied from 0·1 to 2·0 atm., and the path-length from 25 to 100 cm. For mixtures of CO_2 and N_2 Beer's law holds, provided the total pressure is const., but if the total pressure is increased, the law breaks down and the absorption increases. A similar increase was

found with mixtures of water vapour and N_2. For water vapour, even when the total pressure was kept const., Beer's law failed when the partial pressure was increased. The effect of changing the temperatures of the gas and the source of radiation, and the theoretical reasons for the departures from Beer's law, are discussed.

1937 535.343.3

The ultra-violet absorption spectra of protein solutions. JONES, R. N., AND CREECH, H. J. *J. Opt. Soc. Amer.*, 33, *pp.* 209–218, *April*, 1943.—A method is described for the spectrographic analysis of conjugated proteins formed by interaction of serum proteins with the isocyanates of polynuclear aromatic hydrocarbons. The method makes possible the determination of the number of hydrocarbon groups introduced into each protein molecule, provided the hydrocarbon chromophore has max. at wavelengths $> 3\,250$ Å. At wavelengths $< 3\,250$ Å, where the chromophoric groups of the normal protein also absorb, the total absorption is not equivalent to the sum of the absorptions of the several chromophoric groups involved. The spectra of binary solutions of the unconjugated protein and a simple water-soluble compound containing the hydrocarbon chromophore, exhibit deviations from the calculated summation spectra.

See Abstr. 1916 535.345 : 535.241

1938 535.347 : 535.515 : 541.653

The configuration of starch and the starch-iodine complex. I. The dichroism of flow of starch-iodine solutions. RUNDLE, R. E., AND BALDWIN, R. R. **II. Optical properties of crystalline starch fractions.** RUNDLE, R. E., AND FRENCH, D. *J. Amer. Chem. Soc.*, 65, *pp.* 554–561, *April*, 1943.—Starch-iodine solutions exhibit dichroism of flow; light with its electric vector $\parallel$ flow lines is more strongly absorbed than light with its electric vector $\perp$ flow lines. This requires that the long axes of the I molecules in the complex be $\parallel$ the long axis of the complex. The dichroism exhibited by various starches and starch fractions is in agreement with the straight-chain, branched-chain model for the 2 components of starch. The birefringence of the crystalline material from Schoch's butanol-fractionation of starch was examined, together with its dichroism after staining with iodine. The optical properties are interpreted in terms of a helical starch chain.

See Abstr. 1967 535.37 : 537.311.35 = 3

1939 535.371

The quenching of cadmium resonance radiation (3 261 Å) by hydrocarbons and other gases. STEACIE, E. W. R., AND LEROY, D. J. *J. Chem. Phys.*, 11, *pp.* 164–171, *April*, 1943.—The following values of the quenching cross-sections were obtained (in $cm.^2 \times 10^{16}$): H_2 3·54, D_2 1·80, NH_3 0·052, C_2H_4 24·9, C_3H_6 29·1, 1-C_4H_8 35·2, 2-C_4H_8 30·6, C_6H_6 28·4, C_2H_2 22·0, cyclopropane 0·71; C_2H_6, C_3H_8, *n*-C_4H_{10}, *iso*-C_4H_{10} *ca.* 0·02.

1940 535.371

The quantum yield of diacetyl fluorescence. ALMY, G. M., AND GILLETTE, P. R. *J. Chem. Phys.*, 11, *pp.* 188–195, *April*, 1943.—The quantum yield of fluorescence of diacetyl, excited by λ4 047 and λ4 358 is approx. independent of pressure. The yield with excitation of λ3 650 increases from zero at zero pressure to nearly the value obtained for the longer wavelength excitations at 5 cm. Hg. This difference is explained by assuming that predissociation occurs at a level betw. those reached upon λ3 650 and λ4 047 excitations. The observed phenomena of diacetyl fluorescence can be explained in terms of a model which involves a metastable state just below the state reached on absorption.

See Abstr. 1935 535.375.5 : 535.323 : 532.14 : 535.338.42

1941 535.375.5 : 541.57

Raman effect and hydrogen bonds. VIII. A note on the solutions of coumarin in mineral acids. MURTY, G. V. L. N., AND SESHADRI, T. R. *Proc. Indian Acad. Sci. A*, 17, *pp.* 55–57, *Feb.*, 1943.—[See Abstr. 128 (1943)]. The marked solubility of coumarin in aq. mineral acids is attributed to the formation of complexes. That this takes place through H bonds is shown by a study of the Raman spectrum of these solutions wherein the carbonyl frequency is found to be lowered.

1942 535.515 : 539.216.1 : 539.382.2 = 3

Change of the double-refraction/stretching function of isotropic cellulose threads by variation of their conditions of preparation. HERMANS, P. H. *Kolloid Z.*, 98, *pp.* 69–70, *Jan.*, 1942.—The linear character of the function if reduced to the dry state remains as previously found [Abstr. 1943 (1943)], but the slope of the curve is reduced with decreasing cellulose content. R. N.

1943 535.515 : 539.216.1 : 539.388.8 : 539.382.2 = 3

Double refraction of isotropic cellulose fibres oriented by stretching. HERMANS, P. H. *Kolloid Z.*, 98, *pp.* 62–68, *Jan.*, 1942.—[See Abstr. 1355 (1942)]. The higher the degree of swelling the higher the double refraction as dep. on degree of stretching. A linear relation is found if the deg. of stretching is referred to the dry state, but the comparison betw. measurements of swelling and X-ray investigations show that double refraction in the dry state cannot always be used as a measure of orientation. The best orientations are obtained if the stretching is done with the xanthogenate. Further investigations based on a recent theory [Abstr. 1121 (1942)] are desirable. R. N.

See Abstr. 1938 535.515 : 541.653 : 535.347

1944 535.563 : 541.653

Studies on the dependence of optical rotatory power on chemical constitution. XXII. The rotatory dispersion of enantiomeric *o*-, *m*-, and *p*-nitrobenzalaminomethylenecamphors and *p*-dimethylaminobenzalaminomethylenecamphors. SINGH, B. K., AND SEN, S. C. *Proc. Indian Acad. Sci. A*, 17, *pp.* 33–40, *Feb.*, 1943.—Exp. data are presented. The condensation products from benzaldehyde were oils which refused to solidify.

1945 535.568.1

A photo-electric polarimeter. WILLEY, E. J. B. *J. Sci. Instrum.*, 20, *pp.* 74–75, *May*, 1943.—Polaroid is used in place of nicol prisms, the aperture and amounts of light being thereby increased so much that measurements can be made upon a photocell and rendered practically non-subjective.

See Abstr. 2061 535.6 : 548

1946 535.7

Expediting visual adaptation to darkness. KEKCHEYEV, K. *Nature, Lond.*, 151, *pp.* 617–618, *May* 29, 1943.

1947 535.73

Vision at low brightness levels. I. TAYLOR, A. H. *Illum. Engng, N.Y.*, 38, *pp.* 89–98, *Feb.*, 1943.—The eye becomes rel. more and more sensitive to blue light than to red as the brightness level is lowered from about 0·1 ft. lambert (Purkinje effect). The author has measured the sensitivity at all wavelengths when the brightness is at the threshold of visibility, using a 2 deg. photometric field, and the rel. visual brightness of 6 coloured lights (obtained by means of filters) over a wide range of brightness level (0·1 to 0·0001 ft. lambert) and has made some experiments on the additivity of diff. coloured lights at low brightnesses. J. W. T. W.

1948 535.73

Industrial vision. WITTEKIND, J. R. *Illum. Engng, N.Y.*, 38, *pp.* 99–105, *Feb.*, 1943.

1949 535.733.1 : 611.8

On sensory energy, with special reference to vision and colour vision. SHAXBY, J. H. *Phil. Mag.*, 34, *pp.* 289–314, *May*, 1942.—Transformations of the energy of a primary sensory stimulus to that of molecules of the material of a sense-organ lead to the concept of receptor energy, in the form of damped vibrations causing the ejection of electrons. This energy is the quantity S in the Weber–Fechner law $S = K \log I/I_0$. The limitations of the law are discussed in connection with the unequal sharing of stimulus energy among the receptor molecules. The cases of steady stimuli are contrasted with those of periodic stimuli. The values of the visibility function for different wavelengths are calculated. A theory of colour vision based on the electronic content of the discharges of action current, and not requiring the retinal triplication of the trichromatic theory, is shown to lead to an equation for a match in colour which is in accord with observed data.

See Abstr. 1920, 1921 535.81 : 535.243

1950 535.824.2

The development of the microscope objective. BENNETT, A. H. *J. Opt. Soc. Amer.*, 33, *pp.* 123–128, *March*, 1943.—An historical review.

1951 535.83

Ophthalmic lens testing instrument. OGLE, K. N., AND AMES, A., JR. *J. Opt. Soc. Amer.*, 33, *pp.* 137–142, *March*, 1943.—The lens to be tested is mounted so that it can be rotated about a point corresp. to the entrance pupil of the eye. The image of a point source of light is formed by the lens and examined in a telescope. Measurements of the angular displacement of the image as the lens is rotated lead to the evaluation of the angular magnification and the distortion, while the change in focus of the telescope gives a measure of the power of the lens when marginal areas of the lens are used. The mech. construction of the instrument is described and an example is given of the design of a spectacle lens to obtain special magnification properties in addition to the correction of the ordinary refractive errors. W. D. W.

1952 535.833

The theory of the Schmidt telescope. SYNGE, J. L. *J. Opt. Soc. Amer.*, 33, *pp.* 129–136, *March*, 1943.—Discusses the Schmidt coma-free telescope in terms of Hamilton's original theory.

1953 535.843

Analytical patterns in the study of mineral and biological materials. YAGODA, H. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 135–141, *Feb.* 15, 1943.—Divers techniques exist for printing-methods to ascertain the distribution of a particular component in the samples studied. The paper correlates these techniques by the development of a system of 2-dimensional analytical chemistry in which a selected plane of the massive sample plays a rôle similar to that of the sample of powdered material in classical analysis. The object is to reveal the mode of distribution of the chemical components as an adjunct to the established methods of qualitative and quantitative analysis. Each component is characterized by an analytical pattern, and a classification of patterns is given. The medium for the execution of patterns by chem. agencies is discussed and a description of the preparation of the pattern and of the apparatus required is given. H. H. HO.

HEAT. THERMODYNAMICS

See Abstr. 1997 536.421 : 548.5 : 536.7 : 539.2

1954 536.48

Laboratory liquid-air storage. ROEBUCK, J. R. *Rev. Sci. Instrum.*, 14, *pp.* 90–97, *April*, 1943.—A 120 l. triple-wall, silver-plated metal vacuum vessel was designed and built. The radiation theory for its part of the evaporative loss was worked out. The good initial vacuum is maintained by the presence of activated charcoal in a small sphere re-entrant into the large inner sphere.

See Abstr. 1897 536.6 : 532.771

1955 536.653 : 536.658.2 : 539.215.4 = 3

On the influence of superfine grinding on the heats of solution and wetting of sugar and cellulose. GUNDERMANN, J. *Kolloid Z.*, 99, *pp.* 142–147, *May*, 1942.—X-ray interference disappears with superfine grinding [Abstr. 2446 (1941)]. By determining the heat of solution of sugar after grinding for different periods of time, it was shown that the difference in total energy content betw. unground and superfinely ground sugar corresp. to the heat of solution. The latter, therefore, indicates the efficiency of the grinding mill. With cellulose the destruction of the lattice structure is indicated by the heat of wetting. For coke, also, the latter is an indication of the fineness of grinding. R. N.

See Abstr. 1955 536.658.2 : 539.215.4 : 536.653

1956 536.666

Dissociation pressures of compounds of ammonia and trideuterammonia with some metallic salts. HART, A. B., AND PARTINGTON, J. R. *J. Chem. Soc.*, *pp.* 104–118, *March*, 1943.—Measurements of the dissociation pressures of compounds of NH_3 and trideuterammonia with 11 metallic salts are described, and from the results the heats of decomposition of the

various ammines and deuterammines are calculated. In all, 64 systems of the type $M,xN(H \text{ or } D)_3 = M,yN(H \text{ or } D)_3 + (x-y)N(H \text{ or } D)_3$ have been observed at $-50°$ to 300°. The effect of isotopic replacement is demonstrated and briefly discussed.

1957 536.7

Thermodynamics of the liquid state. WATSON, K. M. *Industr. Engng Chem.*, 35, *pp.* 398–406, *April*, 1943.—On the basis of a modified application of the theorem of corresponding states, new methods are presented for the prediction of the thermodynamic properties of liquids. The only data required are the b.p., the critical temperature, critical pressure and the liquid density at some one temperature.

See Abstr. 1997 536.7 : 536.421 : 548.5 : 539.2

See Abstr. 1898 536.7 : 541.128 : 532.782 = 3

1958 536.71 : 532.7

H. L. Callendar and the theory of the liquid state. SILVER, R. S. *Nature, Lond.*, 151, *pp.* 588–589, *May* 22, 1943.

ELECTRICITY. MAGNETISM

1959 537.22 : 677

The electrical properties of fibres. III. ILLINGWORTH, J. W. *Text. Rec.*, *pp.* 46–50, *May*, 1943.—Various electrical effects which take place in fibres are discussed, especially tribo-electric, piezo-electric and pyro-electric effects. Some of these can be used to advantage, e.g. electrostatic methods for producing pile surfaces. The effect of the degree of ionization of the atmosphere is examined; it is remarked that mills run more smoothly in the afternoon than in the morning. The connection betw. this ionization and the static effect in fibres has not been established, the chief influencing factor being magnetic storms. [See Abstr. 1470 B (1943)]. M.-V.

1960 537.221 : 541.135.5

The single potential difference at a cadmium electrode. CHALMERS, J. A. *Phil. Mag.*, 34, *pp.* 349–353, *May*, 1943.—By the method of the scraped electrode it has been found that the "null" solution for a Cd electrode in a solution of $CdSO_4$ is of conc. $1\frac{1}{2}$ *N*. Cd in a normal solution has a single electrode potential of $-0{\cdot}005$ V, which can be taken as zero. [See Abstr. 2613 (1942)].

1961 537.226.1 : 621.396.1 : 621.396.615.14

Measurement of permittivity by means of wave guide. FEJÉR, G., AND SCHERRER, P. *Helv. Phys. Acta*, 15, 7, *pp.* 645–684, 1942.—For investigating the dielectric properties of materials in the wavelength range 1–3 cm., apparatus was developed consisting of a magnetron transmitter and a wave guide of rectangular section. By utilizing the properties of the H-waves the permittivity of crystals could be investigated. The permittivity and absorption of any material was determined by the phase jump occurring when the waves are reflected from the bounding surface of the wave guide. This surface consists of a moveable metal piston which carries on its inner face a plate of the substance to be investigated. By varying the plate thickness a total phase jump of π may be obtained, when simple equations give the constants of the material in terms of the sectional dimensions of the wave guide, the plate thickness and the wavelength employed. A. W.

1962 537.226.2

The influence of hindered molecular rotation on the permittivities of water, alcohols and other polar liquids. OSTER, G., AND KIRKWOOD, J. G. *J. Chem. Phys.*, 11, *pp.* 175–178, *April*, 1943.—The theory of dielectric polarization [Abstr. 4659 (1939)] is used to calculate the permittivities of water and some alcohols. Quasi-rigid co-ordination models, based upon X-ray structural investigations, are employed in the calculation of a function g which measures the orientational correlation betw. neighbours in the liquid. The function g is rel. to the thermodynamic abnormality of polar liquids.

1963 537.226.2 : 553.983 = 3

Dielectric measurements on bitumen and related substances. I–II. WALTHER, H. *Kolloid Z.*, 99, *pp.* 98–107, *April, and pp.* 129–142, *May*, 1942.—The permittivity and its rel. to temperature furnish a simple and accurate means for grading coal tar and pitch, especially with regard to their content of bitumen. Lability and flocculation phenomena are explained. Anomalous electric dispersion in the range of solidification, 110°–125°C., was investigated at const. frequency. The deg. of dispersion depends on the different viscosity values, which themselves are dependent on the tar-oil content. Specially prepared "plastified" pitches have a smaller deg. of dispersion owing to the fixation of dipole molecules of the oil component. The range of dispersion is shifted towards lower temperatures and the freezing of the dipoles is shifted towards higher viscosities in comparison with ordinary tars for which the dispersity range with reg. to temperature is nearly const. with equal viscosities. [See Abstr. 178 (1943)]. R. N.

1964 537.228.1 : 621.39 = 3

The oscillating quartz in communication engineering. BECKERATH, H. v. *ENT* [*Elekt. Nachr. Techn.*], 19, *pp.* 45–62, *March–April*, 1942.—[Abstr. 1778 B (1943)].

1965 537.228.3 : 541.182

The origin and the complications of electric double refraction and of electric dichroism in dilute dispersed systems. HELLER, W. *Rev. Mod. Phys.*, 14, *pp.* 390–409, *Oct.*, 1942.—A study is made of the problem for systems having $<$ 1 g. of dispersed phase per litre dispersed system, with a view to the application of electro-optical anisotropy in colloidal research. The effects normally observed in alternating fields are fully discussed, and also accidental and other complications. Notes are presented on electric dichroism and the origin and complications of magnetic double refraction and magnetic dichroism of dispersed systems in the transverse magnetic field. A. W.

See Abstr. 2023 537.311.32 : 679.5 : 539.501 = 3

1966 537.311.33

The electrical conductivity of lead chromate. LASHOF, T. W. *J. Chem. Phys.*, 11, *pp.* 196–203, *April*, 1943.—The conductivity of sintered pellets of $PbCrO_4$ varies with the temperature in accordance with the law $\sigma \propto \exp(-1{\cdot}48 \text{ eV}/kT)$ in the range 700°–350°C. and with the law $\sigma \propto \exp(-0{\cdot}60 \text{ eV}/kT)$

at lower temperatures. At const. temp. the conductivity increases with decreasing oxygen pressure which indicates that $PbCrO_4$ dissociates in accordance with the equations: $2PbCrO_4 \rightarrow Pb(CrO_2)_2 + Pb^0 + 2O_2$ and $Pb^0 \rightarrow Pb^+ + e$. The energies of these reactions are 5·28 and 1·20 eV, respectively.

1967 537.311.35 : 535.37 = 3

Recent investigations on the conductivity of gelatin dyestuff phosphors. GOMBAY, L. *Kolloid Z.*, 99, *pp.* 28–35, *April*, 1942.—[See Abstr. 2315, 2324 (1942)]. The curves giving the temperature/current relation are strongly influenced by the time during which a current has previously flowed at room temperature. The abs. values of the current min. increase, and the max. values at 150°C. decrease, with increasing voltage. The longer the duration of the preceding current the higher are the abs. values of the peak currents. During uniform increase of temperature an e.m.f. is generated, presumably in the interface betw. phosphor and electrode, the direction being from phosphor to earth at either end of the phosphor plate. R. N.

1968 537.529 : 621.3.015.51

Theory of dielectric breakdown. FRÖHLICH, H. *Nature, Lond.*, 151, *pp.* 339–340, *March* 20, 1943.—The electron theory of solids is applied to the problem of the dielectric b.d. To this purpose the m.f.p. of electrons in ionic crystals and its dependence on temperature and electron energy is determined mathematically. The expression is applied to a crystal of the NaCl type and a general equation is evolved for its intrinsic electric strength. The results obtained are confirmed by experiment. The variation of dielectric strength with thickness can be explained theoretically and it is foreshadowed that the same theory which explains the dielectric properties of ionic crystals may also apply to non-polar crystals.

R. H. G.

1969 537.533.74

The small-angle scattering of electrons by aluminum. DEES, B. C., AND HAMERMESH, B. *Phys. Rev.*, 63, *pp.* 297–303, *April* 1 *and* 15, 1943.—The ang. distribution of 46·4 ekV electrons scattered by an Al foil $1{\cdot}3 \times 10^{-5}$ cm. thick was studied in the range 0–10°. The values for the mean projected angle were compared with those predicted by theory.

1970 537.533.9 : 621.385.833 = 3

On the intensity relations in the supermicroscope. Communication I. The blackening of photographic plates by electron beams. BORRIES, B. VON. *Phys. Z.*, 43, 11–12, *pp.* 190–204, 1942.—[Abstr. 1774 B (1943)].

See Abstr. 1971 537.533.92 : 537.563

See Abstr. 1912, 1913 537.534 : 535.23 = 3

1971 537.563 : 537.533.92

Negative ions of atomic and molecular oxygen. BATES, D. R., AND MASSEY, H. S. W. *Phil. Trans. A*, 239, *pp.* 269–304, *April* 2, 1943.—A detailed examination of the $(1s)^2(2s)^2(2p)^4(3s)$ excited configuration of O^- has been made in order to discover whether it can give rise to the observed stable excited state in which the attached electron has nearly zero binding energy. According to the Hartree–Fock self-consistent field method, stable excited *P* terms are only found when the polarizability is 2–4 times as large as that deduced for O from the refractivity of O_2. Radiative attachment and detachment rates are calculated for a number of values of the polarizability parameter. These rates are very sensitive to the value of the binding energy of the 3*s* electron in O^-, if it is small. Investigation of the deep electronic states of O_2^- shows it to be very unlikely that O_2^- ions can be formed by attachment of slow electrons to O_2 at low pressures, by a pressure-independent process other than direct radiative attachment. The formation of pairs of oppositely charged ions from molecules by impact of electrons or light quanta is investigated on the basis of the crossing of molecular p.e. curves. A cross-section of 10^{-13}–10^{-12} cm.^{2} is possible for mutual neutralization of oppositely charged O ions by electron transfer on impact, but a value as high as 10^{-11} cm.^{2} is very unlikely. The electron affinity of O_2^- is about 1 eV. A. J. M.

1972 537.591

Committee on Co-ordination of Cosmic-Ray Investigations. *Carnegie Instn Yearb.*, 41, *pp.* 87–102, 1941–1942.—[See Abstr. 1837 (1942)]. Progress report for July 1941 to June 1942.

1973 537.591.1

Cloud-chamber and counter studies of cosmic rays underground. WILSON, V. C., AND HUGHES, D. J. *Phys. Rev.*, 63, *pp.* 161–171, *March* 1 *and* 15, 1943.—A counter-controlled cloud chamber and 2 counter coincidence sets were used to study the nature of the cosmic rays observable underground. The experiments were performed in a copper mine at depths of 71, 141, 582 and 657 m. water equivalent.

1974 537.591.1

The nature of the primary particles responsible for cosmic-ray phenomena. SWANN, W. F. G. *Phys. Rev.*, 63, *pp.* 210–211, *March* 1 *and* 15, 1943.

1975 537.591.5

Cosmic-ray stars at 10 000 feet. HAZEN, W. E. *Phys. Rev.*, 63, *pp.* 213–214, *March* 1 *and* 15, 1943.

1976 537.591.8

The cascade theory with collision loss. BHABHA, H. J., AND CHAKRABARTY, S. K. *Proc. Roy. Soc. A*, 181, *pp.* 267–303, *May* 6, 1943.—[See Abstr. 1632, 2076, 3555 (1937)]. A solution of the cascade equations is given in the form of a series; the series is so rapidly convergent that the first term alone gives to a considerable deg. of accuracy the whole energy spectrum of electrons from the highest to far below the critical energy. For thicknesses $> 1{\cdot}5$ in the characteristic unit of length the number of particles of energy E increases monotonically with decreasing E, but the spectrum gets flattened for energies $<$ the crit. energy. For $t < 1{\cdot}5$, the spectrum has a different shape, decreasing as E decreases from the primary energy and then increasing again to the smallest E, the flattening taking place only for $E < \beta t$. Neglect of collision loss sometimes causes the number of electrons of the critical energy to be 7 times too large.

1977 538.22 : 669.14 : 669.24

A magnetic study of the two-phase iron-nickel alloys. II. HOSELITZ, K., AND SUCKSMITH, W. *Proc. Roy. Soc. A*, 181, *pp.* 303–313, *May* 6, 1943.—[See Abstr. 2264 (1940)]. The phase diagram was

determined betw. 525° and 365°C. The mechanism of phase segregation from the single-phase α-state was studied; one of the phases crystallizes out in its equilibrium conc. whilst the residue of the alloy approaches equil. composition.

1978 538.3

The force required to give a small acceleration to a slowly moving sphere carrying a surface charge of electricity. SEARLE, G. F. C. *Phil. Mag.*, 34, *p.* 360, *May*, 1943.—Erratum. [See Abstr. 886 (1943)].

1979 538.522.3 : 621.3.011.3 = 3

The mutual inductance of co-axial circular rings in the presence of a permeable core. BUCHHOLZ, H. *Z. techn. Phys.*, 23, 9, *pp.* 221–234, 1942. *Abstr. in Wireless Engr*, 20, *p.* 250, *May*, 1943.

1980 538.566.2 : 621.396.11

Suggestions for a theory of the coastal refraction. GRÜNBERG, G. *Phys. Rev.*, 63, *pp.* 185–189, *March* 1 *and* 15, 1943.—An approx. method of attacking the problem of the refraction of electromagnetic waves when passing from sea to shore is based on the fact that an electromagnetic field varying with time can penetrate only slightly into a sufficiently good conductor. It is thus possible to formulate an approx. boundary condition at the surface of separation of 2 media of greatly differing conductivity. A. J. M.

1981 538.566.3

Reflection of electromagnetic waves from a parabolic ionized layer. RYDBECK, O. E. H. *Phil. Mag.*, 34, *pp.* 342–348, *May*, 1943.—An expression for the exact virtual height for a parabolic ionized layer is obtained, and values obtained are compared with the classical height. The difference is greater the thinner the layer. A. J. M.

1982 538.7(09)

Some early contributions to the history of geomagnetism. I. HARRADON, H. D. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 3–17, *March*, 1943.

MOLECULAR AND ATOMIC PHYSICS

1983 539.132

The vibration-rotation energies of the linear X-Y-Z type molecule. NIELSEN, A. H. *J. Chem. Phys.*, 11, *pp.* 160–163, *April*, 1943.—The vibration-rotation energies of the linear X-Y-Z type molecule are derived [see Abstr. 831 (1942)]. By the proper substitutions the energy expressions are reduced to the ones appropriate for the XY_2 type molecule and compared with the work of Dennison [Abstr. 2984 (1940)].

1984 539.132 : 541.56

Quantization of molecules, inter- and intramolecular forces. FAJANS, K., AND BERLIN, T. *Phys. Rev.*, 63, *pp.* 309–312, *April* 1 *and* 15, *Errata*, *p.* 399, *June* 1 *and* 15, 1943.—In diatomic molecules (P_2) the distinction is made betw. the quantization of the electrons of the atomic cores (P^{5+}), assumed to be the same ($1^2 2^8$) as in the free atom (P), and of the valence electrons $3^{2\cdot2}(P^{5+})\Pi^2(P^{5+})3^{2\cdot2}$. The Pauli principle is applied sep. to the quantization of shared electrons and to the others. It is possible to interrelate the difference in the strength of the external field of N_2 and P_2 with the size of the atomic cores N^{5+} and P^{5+}. The comparison of the intramolecular binding strength in (AB) with that in $(AB)^+$ supports the conclusions: in N_2 all 10 valence electrons, in HCl all 8 participate in the binding of the cores N^{5+} and N^{5+}, H^+ and Cl^{7+}; the molecules of monohydrides of + di- and trivalent elements contain deformed H^-.

1985 539.133 : 541.57

Electric moments of ortho-substituted phenols and anisoles. I. Halogen derivatives. ANZILOTTI, W. F., AND CURRAN, B. C. *J. Amer. Chem. Soc.*, 65, *pp.* 607–611, *April*, 1943.—A comparison of observed electric moments of *o*-fluoroanisole, *o*-chloroanisole, *o*-bromoanisole and *o*-chlorophenetole in benzene solution with calc. values reveals that the double-bond character of the ring-to-oxygen bond is sufficient to lock these molecules in a *trans*-configuration. The moments for *o*-fluorophenol, *o*-chlorophenol and *o*-bromophenol in CCl_4 show that betw. 85% and 90% have the hydroxyl group in the *cis*-position. The large moments of these compounds in dioxane indicate that dioxane forms H bonds with the *trans*-molecules and causes a shift in the *cis–trans* equilibrium.

1986 539.152.1

Strong-coupling mesotron theory of nuclear forces. SERBER, R., AND DANCOFF, S. M. *Phys. Rev.*, 63, *pp.* 143–161, *March* 1 *and* 15, 1943.—A theory of nuclear forces is developed, based on the hypothesis that the interaction betw. a nuclear particle and the mesotron field is strong. Two types of mesotron fields are considered, the charged scalar and the neutral pseudoscalar. The latter, for large enough separation, gives forces betw. 2 nuclear particles of the same type as those obtained from perturbation theory and with the spin dependence and exchange properties required to fit experiment. At closer approach the forces become ordinary (non-spin-dependent). It is impossible to obtain spin-dependent forces which extend to small separations and are of sufficient strength to account for the properties of the deuteron.

1987 539.152.1

Saturation character of nuclear forces and meson theory. WENTZEL, G. *Helv. Phys. Acta*, 15, 7, *pp.* 685–698, 1942.—With strong coupling, meson theory predicts the existence of isobares of protons with higher charges and spin values. Terms corresp. to transformations into these states in operators imperil the saturation of nuclear force. The stability of heavy nuclei is investigated from this viewpoint on the basis of a Thomas–Fermi approximation.

A. J. M.

1988 539.153

Electronic energy bands in body-centred iron. MANNING, M. F. *Phys. Rev.*, 63, *pp.* 190–202, *March* 1 *and* 15, 1943.—There are 2 filled and 4 partially filled bands. The lowest 2 filled bands are responsible for the cohesion; the next 3 partially filled bands for the ferromagnetism; and the highest band is responsible for the electrical conduction. The density of states is calculated as a function of the energy and compared with similar results obtained by Greene for face-centred iron. The density of states at the highest occupied energy level is 17 electrons/atom-Rydberg compared with 11 electrons/atom-Rydberg for face-centred Fe. This accounts for the fact that body-centred Fe is ferromagnetic, but face-

centred Fe is not. It also indicates a greater electronic sp. ht. for body-centred than for face-centred Fe. This higher electronic sp. ht. is responsible for the high temperature change from a face-centred to a body-centred structure.

1989 539.153

Electronic energy bands in face-centred iron. GREENE, J. B., AND MANNING, M. F. *Phys. Rev.*, 63, *pp.* 203–210, *March* 1 *and* 15, 1943.—There are 2 filled and 4 partially filled bands. The density of states is calculated as a function of the energy; the curves of the density of states *v.* energy appear quite similar to those calculated by Slater for Cu but resemble more closely those for body-centred Fe. The results are used to calculate the average Fermi energy as a function of the total number of valence electrons; to investigate the ferromagnetism of Ni and Co by calculating the change in Fermi energy as a function of the number of uncompensated spins; and to calculate the electronic sp. ht. at an elevated temperature.

See Abstr. 1932 539.153 : 535.338.3

See Abstr. 1995 539.155.2 : 539.167.3

1990 539.16.08

Geiger–Müller counter pulse size. MILLER, C. W. *Rev. Sci. Instrum.*, 14, *pp.* 68–76, *March*, 1943.—Describes equipment for measuring the pulse size from Geiger–Müller counters; the results are given for the gas mixtures 90% He, 10% H_2; 90% Ne, 10% H_2; 90% A, 10% H_2; 100% H_2 and 90% A, 10% O_2 for 2–30 cm. Hg, and for a mixture of 9·7 cm. of A and 1·2 cm. of ethyl alcohol.

1991 539.16.08 = 3

Determination of surface and measurement of diffusion by radioactive rare gases (practice and quantitative applications of the emanation method). II. The evaluation of the measurements. ZIMENS, K. E. *Z. phys. Chem. A*, 191, *pp.* 95–128, *Aug.*, 1942.—[See Abstr. 415 (1943)]. The importance of the method for qualitative statements is due to the fact that changes in emanation power indicate changes inside the solid substances, e.g. lattice transformations, dehydration, decompositions, reactions etc., and with simple apparatus continuous measurements are possible. The main application of the method is the quantitative determination of surface and diffusion const. The evaluation of the relation betw. total emanation power and temperature, the separation of total emanation power into recoil and diffusion components and their use for quantitative determinations with Rn alone or with 2 emanations, e.g. Tn and Rn or Tn and An, are discussed. R. N.

1992 539.166.8

Nuclear photo-effect with γ-rays. I. Light elements up to calcium. HUBER, O., LIENHARD, O., SCHERRER, P., AND WÄFFLER, H. *Helv. Phys. Acta*, 16, 1, *pp.* 33–58, 1943.—Apparatus is described for studying the nuclear photo-effect with light elements using Li γ-rays. The $\frac{1}{2}$-life periods and efficiencies are given for the following transformations:

$^{14}_{7}N \rightarrow {}^{13}N$, $^{16}_{8}O \rightarrow {}^{15}O$, $^{19}_{9}F \rightarrow {}^{18}F$, $^{24}_{12}Mg \rightarrow {}^{23}Mg$, $^{27}_{13}Al \rightarrow {}^{26}Al$, $^{32}_{16}S \rightarrow {}^{31}S$, $^{35}_{17}Cl \rightarrow {}^{34}Cl$, $^{39}_{19}K \rightarrow {}^{38}K$, $^{40}_{20}Ca \rightarrow {}^{39}Ca$, $^{63}_{29}Cu \rightarrow {}^{62}Cu$. [See Abstr. 227 (1943)].

A. J. M.

1993 539.166.831

Nuclear energy levels in Fe^{56} from the decay of Mn^{56} and Co^{56}. ELLIOTT, L. G., AND DEUTSCH, M. *Phys. Rev.*, 63, *pp.* 321–322, *April* 1 *and* 15, 1943.

1994 539.166.93 : 620.17

Gamma-ray examination of materials. CROXSON, C. *Trans. Instn Engrs Shipb. Scot.*, 86, *pp.* 165–194, *April*, 1943.—Discusses the application of γ-ray radiography to engineering. Ra and radon as γ-ray sources are compared, and a description is given of the examination of castings, weldings, etc. The description is accompanied by many illustrations. J. T.

1995 539.167.3 : 539.155.2

Radioactive isotopes of mercury. FRIEDLANDER, G., AND WU CHIEN-SHIUNG. *Phys. Rev.*, 63, *pp.* 227–234, *April* 1 *and* 15, 1943.—[See Abstr. 515 (1942)]. The isotopes produced by bombardment of Hg with neutrons and by bombardment of Au with deuterons were studied. Two activities with $\frac{1}{2}$-lives of 23 hr. and 64 hr., respectively, both decaying by *K*-electron capture, are assigned to Hg^{197} on the basis of critical absorption measurements made on the X-rays emitted. The 43 min. activity produced by fast neutrons in Hg belongs to an excited state of an isotope and decays by isomeric transition to the ground state. A 51·5-day β-emitter was studied.

1996 539.181

Average H–H_2 repulsive potential from collision cross-section measurements. AMDUR, I. *J. Chem. Phys.*, 11, *pp.* 157–159, *April*, 1943.—The potential is computed from exp. values of elastic collision cross-sections for fast H atoms (200–800 eV) scattered in room-temperature H_2. The classical equations are solved explicitly by analytical representation of the exp. cross-section values as function of the rel. kinetic energy of the scattering system. The potential function so obtained predicts total collision cross-sections within exp. error.

1997 539.2 : 536.7 : 536.421 : 548.5 = 3

The disperse structure of solid systems and its thermodynamic foundation. VIII. Melting and crystallizing from the viewpoint of the theory of coalescent conglomerates with natural crystal systems. BALAREW, D. *Kolloid Z.*, 99, *pp.* 157–159, *May*, 1942.—[See Abstr. 1898, 2002 (1943)]. In every natural crystal system (coalescent conglomerate) there are components without crystal structure at the surface, which soften at a certain high temperature. This softening proceeds in a stable manner also in melting and in the formation of new crystals. Only differences in the equilibrium dimensions of free and coalescent elementary crystals may cause leaps in the process of melting and crystal formation. These processes are likened to peptization and coagulation. R. N.

See Abstr. 1892 539.211 : 532.692

1998 539.214.07 : 679.5

Recording plastometer for organic plastics. BIONDI, F. J. *Brit. Plast. Mould. Prod. Tr.*, 14, *pp.* 687–688, *April*, 1943.—[Abstr. 899 (1943)].

1999 539.214.9

The lateral pressure of sand. FORDHAM, A. A. *Engineering*, 155, *p.* 341, *April* 30, 1943.—In continuation of previous work (*ibid.*, 143, *p.* 561, 1937), the lateral pressure of sand due to heads up to 7½ ft.

above the gauge centre has been studied. Measured pressures are less than values calculated in accordance with the wedge theory, the latter being considerably in excess of the former for the greater depths of sand.
J. S. G. T.

2000 539.215

Some factors affecting the compaction of sands. Tuyl, F. M. Van, Waldschmidt, W. A., and Baird, J. D. *Min. Mag.*, 23, *pp.* 71–74, *Feb.*, 1943.—Exp. data reveal a wide variation in the deg. of reduction of vol. under pressure. The primary porosity of a sand and its susceptibility to compaction depends upon the conditions of sedimentation. The authors, employing sand derived from a friable sandstone from the Dakota formation, compare the deg. of compaction obtained in the laboratory with that attained in nature.

2001 539.215 = 3

Dispersoid-chemical and related facts with sintered hard metals. Skaupy, F. *Kolloid Z.*, 98, *pp.* 92–95, *Jan.*, 1942.—The behaviour of metal carbides sintered together by means of an additional metal is discussed, especially with regard to additional metals. As explanation for the hardness of the material it is suggested that the carbide dissolved in the liquid additional metal is secluded on cooling and assembled on the surface of the undissolved carbide grains, so that a continuous solid framework of carbide is formed, the pores of which are filled with the additional metal, e.g. Co. Questions of press-sintering are briefly dealt with.
R. N.

2002 539.215 : 548 = 3

Disperse structure of solid systems and its thermodynamic foundation. VI. Application of Gibbs–Thomson's equation to crystals. Balarew, D. *Kolloid Z.*, 98, *pp.* 43–45, *Jan.*, 1942.—[See Abstr. 422 (1943)]. Gibbs–Thomson's equation is only applicable to idealized crystals while the author's investigations refer to natural macrocrystals, especially coalescent conglomerates. This accounts for the apparent contradictions betw. the theories.
R. N.

See Abstr. 2051 539.215.3 : 541.183

See Abstr. 1955 539.215.4 : 536.658.2 : 536.653

See Abstr. 1926 539.216.1 : 535.322.4

See Abstr. 1942 539.216.1 : 539.382.2 : 535.515 = 3

See Abstr. 1943 539.216.1 : 539.388.8 : 539.382.2 : 535.515 = 3

2003 539.216.1 : 661.713 = 3

The influence of the procedure of manufacture of viscose on the properties of the thread. Schwarz, H., and Wannow, H. A. *Kolloid Z.*, 99, *pp.* 190–216, *May*, 1942.—Degree of polymerization, solubility in alkali, strength and elongation, swelling, orientation, and form of cross-section were investigated for fibres of cellulose regenerates spun with the nozzle and the open-funnel process. The influence of maturing and of the method and speed of drawing-off is discussed.
R. N.

2004 539.216.1 : 676.1

Further experimental study of beater practice in the manufacture of offset papers. Weber, C. G., Shaw, M. B., and O'Leary, M. J. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 267–280, *April*, 1943.—73 papers have been made in the Bureau's exp. paper mill to determine the rel. betw. the mechanical beating of the fibres and the properties of offset papers made from them. Old rags withstood the prolonged beating required for the development of max. strength and optimum formation without the adverse effects of such treatment noted in wood fibres. All the rag-fibre papers had lower expansivity than wood-fibre papers of corresp. bond strength, and the mixture of old-rag fibres with strong sulphite, in equal proportions, produced papers with folding endurance approaching the average for the two pulps. Papers made of the sulphite pulp and wood-fibre filler pulp in like proportions have fold values little above that of the weaker pulps. The addition of clay filler to a sulphite paper lowered the expansivity in the machine direction but did not lower it appreciably in the cross direction.

2005 539.232 : 621.357.8

Anodic and surface conversion coatings on metals. Edwards, J. D. *Trans. Electrochem. Soc.*, 81, *pp.* 341–357, 1942.—[Abstr. 1758 B (1943)].

2006 539.26

Diffraction of X-rays by sodium stearate at room temperature. McBain, J. W., Bretteville, A. de, Jr., and Ross, S. *J. Chem. Phys.*, 11, *pp.* 179–183, *April*, 1943.—The α-form of Na stearate was re-examined; the data conform with those of the previous investigation [Abstr. 3430 (1936)]. Re-examination of the monoclinic β-form of Na stearate, obtained by heating the rhombic form above 54°C., yields a different set of data. A new, more stable, monoclinic form has been examined and designated as the γ-form.

2007 539.26 : 539.4.016 : 548.73 : 669.71

The structure of rolled and annealed aluminium as revealed by X-rays. Spillett, E. E. *J. Inst. Met.*, 69, *pp.* 149–175, *April*, 1943.—Whereas the orientation developed during rolling usually approximates to (112) fibring, the method of cold-rolling (sheet or strip) influences the type of fibring; an intermediate anneal reduces the deg. of fibring and gives a more uniform product by eradicating inhomogeneity handed down from the hot-rolling. During the annealing of hard-rolled Al, recrystallization will begin and end in the surface layers at rel. lower temperatures than at the centre; while if an intermediate anneal is applied such differences are minimized. An intermediate anneal at 360°C. will lower the recrystallization temperature of the final product, yet if the anneal is carried out at 500°C. this temperature is raised. The mode of deformation of the crystals and/or their boundaries during cold-rolling may be influenced by the annealing temperature. Cold-rolled Al usually recrystallizes with random orientation. With high-purity Al preferential recrystallization may occur, and marked preferred orientation may develop approx. to a cube face in the plane of rolling and a cube edge in the rolling direction. A variation in lattice spacing exists throughout the thickness of hard-rolled strip, and if an intermediate anneal is applied, the lattice spacing in the final product is influenced by the temperature of the intermediate anneal. Mech. softening which occurs before recrystallization is accompanied by an increase in lattice spacing which decreases during recrystallization.

2008 539.26 : 539.4.016.2

New X-ray evidence on the nature of the structural changes in cold-worked metals. WOOD, W. A., LIPSON, H., AND STOKES, A. R. *Nature, Lond.*, 151, *p.* 585, *May* 22, 1943. *Corresp., pp.* 20–21, *July* 3, 1943.

2009 539.26 : 548 : 669.25

An X-ray study of the transformation of cobalt. EDWARDS, O. S., AND LIPSON, H. *J. Inst. Met.*, 69, *pp.* 177–188, *April*, 1943.—Photographs of powder show that above 500°C. the cubic form is stable. As the specimen is cooled it remains cubic down to about 300°C., at which temperature a small amount becomes hexagonal; this amount does not increase with time. As the temperature is reduced, the amount of the hexagonal form increases, and at room temperature about equal amounts of the two forms are present. With increase of temperature there is no change until the specimen becomes completely cubic just below 500°C. Rod specimens behave differently. The transformation on cooling begins at a higher temperature—about 400°C.—and is almost complete at about 300°C.; on heating, the transformation back to the cubic form takes place again at about 500°C.

2010 539.26 : 621.386

Crystallography for routine analysis. WALKER, C. H. *Metrop.-Vick. Gaz.*, 20, *pp.* 167–173, *April*, 1943. *Engineer, Lond.*, 175, *pp.* 492–494, *June* 18, 1943.—[Abstr. 1776 B (1943)].

See Abstr. 2030 539.261 : 541.124 : 621.355.15

2011 539.266

The structure of liquid carbon tetrachloride. EISENSTEIN, A. *Phys. Rev.*, 63, *pp.* 304–309, *April* 1 *and* 15, 1943.—X-ray diffraction patterns of liquid CCl_4 at 27°C. were obtained by photographic and counter methods. The corrected patterns were subjected to a Fourier analysis. In addition to showing the C–Cl and Cl–Cl distances within the molecule, the intermol. distances and conc. are indicated. The lat. ht. of vaporization is calculated.

2012 539.27

Electron diffraction. THOMSON, G. P. *J. Inst. Met.*, 69, *pp.* 191–199, *May*, 1943. *Abstr. in Engineer, Lond.*, 175, *p.* 409, *May* 21, 1943.—Special applications are considered: the study of the nature of the polished layer on metals; the orientation of oil molecules during boundary lubrication; the structure and orientation of crystals deposited on other crystal surfaces and of compounds formed in the solid state.

ELASTICITY. STRENGTH

2013 539.31

Theory of large elastic deformations. TRELOAR, L. R. G. *Nature, Lond.*, 151, *p.* 616, *May* 29, 1943.

2014 539.31 : 620.17

The problem of combined stress. GUEST, J. J. *Engineering*, 155, *pp.* 21–23, *Jan.* 8 ; 101–102, *Feb.* 5; 222, *March* 19; 281–282, *April* 9, *and pp.* 303–304, *April* 16, 1943.—It is premised that as, in most machinery, parts are subjected to more than one princ. stress, design cannot be carried out correctly without a knowledge of the law of elastic failure under combined stress. The theory of elasticity assumes that the structure of materials is indefinitely fine, whereas actual metal has a crystalline structure, the crystals are atomic and the atoms are electrical systems. In experimenting, therefore, the size of the specimen may be a matter of importance. The following propositions are discussed: It seems probable that the coeff. of volumetric stress is > 0, the intermediate principal stress cannot have any effect in elastic failure; shearing stress alone is effective in producing elastic failure. The author's researches led to the criterion that elastic failure occurred when the shearing stress together with a fraction of the volumetric stress reached a specific amount, and the algebraic expression of this criterion contains 2 variable factors, a strength factor and a ductility-brittleness factor, and it is argued that no single-const. criterion can be true. Researches are described or mentioned which are regarded as showing good agreement with the Guest criterion which is defended by the author as being neither hypothetical nor empirical. The series of papers is a defence of the author's results and views on the law of elastic failure. G. E. A.

2015 539.319

Tessellated stresses. II. LÁSZLÓ, F. *J. Iron Steel Inst.*, [23 *pp.*], 1942. *Advance copy.*—[See Abstr. 753 (1943)]. Results of investigations of materials consisting of components with different elastic const. are discussed, with sp. ref. to cast and malleable iron. Strain energy is studied with regard to phase transformation. Tessellated stresses in the free surface are analysed and their possible rôle in connection with damping and surface deficiency in fatigue is pointed out.

2016 539.373

Directional characteristics of single-texture-structure copper strip. COOK, M., AND RICHARDS, T. L. *J. Inst. Met.*, 69, *pp.* 201–207, *May*, 1943.—The resolved shear on the slip planes in slip directions has been calculated in terms of the applied stress in various directions for Cu strip with the single-texture type of structure, which resembles that of a single crystal. These values have been correlated with tensile strength and elongation values in different directions, and with the earing effects on cups cut from the strip.

2017 539.374.2 : 621.771

The distribution of strains in the rolling process. MACGREGOR, C. W., AND COFFIN, L. F., JR. *J. Appl. Mech.*, 10, *A13–A20, March*, 1943.—A series of experiments are described in which the complete strain distributions are given for Cu bars rolled with a varying number of passes in different directions at a reduction of 20% per pass. The effects of different rolling sequences on the strain patterns are described. Alternate passes in different directions produce less distorted networks than rolling in the same direction for each pass. The presence of tensile elastic strains ahead of the rolls was demonstrated by the use of a brittle lacquer, and comparisons were drawn betw. these and the elastic strains produced in lateral compression tests betw. rollers of the same dia.

See Abstr. 1942 539.382.2 : 539.216.1 : 535.515 = 3

See Abstr. 1943 539.382.2 : 539.216.1 : 539.388.8 : 535.515 = 3

See Abstr. 1943 539.388.8 : 539.382.2 : 539.216.1 : 535.515 = 3

2018 539.388.8 : 678 = 3

Sorption of water by rubber in connection with some general questions of swelling. VEITH, H. *Kolloid Z.*, 98, *pp.* 52–62, *Jan.*, 1942.—The relation found empirically, that the quantity of water absorbed by technical rubber is $\propto t^{1/2}$, is explained theoretically under the assumption that the speed of sorption is $\propto$ the diff. of external and internal v.p., the latter following Raoult's law. The influence of elastic tension is discussed and found to be negligible with rubber, but not with substances having a higher degree of swelling, e.g. gelatin. Here the pressure of swelling is partially compensated by the elastic tension and this accounts for the non-linearity of the function (pressure of swelling)/conc. R. N.

2019 539.4

Mechanical properties of polymeric materials. TOBOLSKY, A., AND EYRING, H. *J. Chem. Phys.*, 11, *pp.* 125–134, *March*, 1943.—A molecular model in terms of which the elastic viscous properties of rubber-like substances can be interpreted is presented. Experiments on stress relaxation at const. extension, creep under const. load, extrusion, vibration and breaking are discussed in terms of a mathematical formulation of this model.

See Abstr. 2007 539.4.016 : 548.73 : 669.71 : 539.26

See Abstr. 2008 539.4.016.2 : 539.26

2020 539.431 : 679.5

Fatigue resistance of flexible plastic sheetings. DUGGAN, F. W., AND FLIGOR, K. K. *Industr. Engng Chem.*, 35, *pp.* 172–176, *Feb.*, 1942.—A flex-fatigue test procedure for determining the fatigue resistance of flexible plastic sheetings is described and the detailed exp. results obtained are presented. The following conclusions are drawn: (1) The fatigue life of flexible vinyl sheeting is 30–200 times longer at 25°C. than at 0°C. (2) The method of flexing is not critical. (3) Alternation of tension with flexing reduces life. (4) Press-polished sheeting has 2–3 times the fatigue life of mat finished. (5) Of the vinyl resins, a high-mol.-wt. copolymer of vinyl chloride and vinyl acetate provide sheetings with greatest fatigue resistance. (6) Fatigue life increases rapidly with plasticizer content. (7) Fatigue resistance is not much affected by type of plasticizer used. (8) Fillers reduce the fatigue life although in one special case there was an improvement. (9) Colouring agents have no appreciable effect in the 1–2% conc. normally used. A. M. T.

2021 539.434 : 620.17

100 000-hour creep test. ROBINSON, E. L. *Mech. Engng, N.Y.*, 65, *pp.* 166–168, *March*, 1943.—On Oct. 8, 1942, was completed a series of 100 000 hr. (11½ yr.) creep tests of 4 bars of S.A.E. 4330 type Ni-Cr-Mo steel. The bars were kept at 842°F. throughout, except for a brief period when, after 37 000 hr., the furnace was shut down, moved to another building and restarted. During the test the bars were subjected to respective stresses of 25, 21, 17 and 13 000 lb./in.^{2} Their moduli at 842° varied round about 25×10^6 lb./in.^{2}, and the plastic extension throughout the test is graphed. Details of composition, heat treatment and physical properties are given, with 4 photomicrographs. G. E. A.

2022 539.434 : 679.5

Creep and creep recovery in plasticized polyvinyl chloride. LEADERMAN, H. *Industr. Engng Chem.*, 35, *pp.* 374–378, *March*, 1943.—Long-duration creep and recovery and deformation obtained with on-and-off loading for various periods are determined. With certain exceptions, the flow observed is completely reversible, i.e. of the nature of a delayed elasticity, and obeys the superposition principle. A physical explanation is given, according to which creep and creep recovery are due to straightening and re-folding of primary valence chains. The retarding forces are due to secondary forces betw. the chains and are diminished by temperature rise or incorporation of plasticizer. A. M. T.

2023 539.501 : 537.311.32 : 679.5 = 3

On the effect of softeners on polyvinyl chloride. LEILICH, K. *Kolloid Z.*, 99, *pp.* 107–113, *April*, 1942.—Relations betw. the viscosities of the components at const. and varying temperatures, and betw. viscosity and electric conductivity, are discussed for mixtures of polyvinyl chloride and softeners. Practical hints are given for preparing the mixtures and for testing the softeners. R. N.

2024 539.56 : 678

Brittle temperature of rubber under variable stress. KEMP, A. R., MALM, F. S., AND WINSPEAR, G. G. *Industr. Engng Chem.*, 35, *pp.* 488–492, *April*, 1943.—Although the brittle temperature is sharply defined under high-speed bending through a sharp angle, it is lower as the speed of application or the magnitude of the stress is reduced. Vulcanized pure-gum natural rubber and plasticized polyvinyl-chloride-acetate co-polymer showed the largest changes, whereas the compounded and vulcanized natural and synthetic rubbers exhibited a reduction in brittle temperature from 5° to 10°C. in going from the highest to the lowest stress employed.

2025 539.62 : 541.68

Long-chain molecules in aqueous urea solution. CLARK, R. E. D. *Nature, Lond.*, 151, *pp.* 642–643, *June* 5, 1943.

PHYSICAL CHEMISTRY

See Abstr. 1893 541.123.2 : 532.7 = 3

2026 541.123.23

Temperature/concentration equilibria in the system dimethylaniline-sulphur-dioxide. BRIGHT, J. R., AND FERNELIUS, W. C. *J. Amer. Chem. Soc.*, 65, *pp.* 637–639, *April*, 1943.—The compound $C_6H_5(CH_3)_2N{:}SO_2$ was identified and isolated and its congruent m.p. determined. Cryoscopic mol. wt. measurements for $C_6H_5(CH_3)_2N{:}SO_2$ dissolved in dimethylaniline indicate association of the solute. The deg. of association increases with increasing conc.

2027 541.123.7 : 518.4

Interconversions of polycomponent compositions by graphical methods. SUN, K. H., AND SILVERMAN, A. *Industr. Engng Chem.*, 35, *pp.* 497–498, *April*, 1943.—[See Abstr. 2675, 3111 (1942)].

2028 541.123.7 : 518.4

Graphical interconversions for multicomponent systems. LESLIE, J. D. *Industr. Engng Chem.*, 35,

pp. 495–496, *April*, 1943.—The method [Abstr. 2675 (1942)] for the interconversions of wt., vol. and molar compositions is extended to multiple systems.

2029 541.124

The kinetics of the aqueous hydrolysis of sodium phenylbromoacetate and sodium phenylchloroacetate. BULCRAIG, W. R., AND DAWSON, H. M. *J. Chem. Soc.*, *pp.* 80–84, *March*, 1943.—The hydrolysis is unaffected by excess of alkali or by the products, and the reaction is accurately unimolecular in presence of excess of alkali. Equations are derived for the expected deviation from the unimolecular equation in neutral solution. Evidence of the formation of intermediate compounds in weakly alkaline and in neutral solutions is given, and the mechanism of the hydrolysis is discussed. A reaction betw. $AgNO_3$ and Na phenylbromoacetate was found to be autocatalytic.

2030 541.124 : 539.261 : 621.355.15

X-ray studies of storage-battery pastes. MRGUDICH, J. N. *Trans. Electrochem. Soc.*, 81, *pp.* 165–173, 1942.—[Abstr. 1746 B (1943)].

2031 541.124 : 669 = 3

The sintering processes in powders consisting of a single component.—A contribution to elucidating the processes of metal ceramics and oxide ceramics. 3rd comprehensive communication on the course of chemical processes in which solid substances are concerned. HÜTTIG, G. F. *Kolloid Z.*, 98, *pp.* 6–33, *Jan.*, 1942.—Experimental results are collected concerning the changes which occur in a uniform powder with gradually increasing temperature. The following substances are dealt with: Cu, Fe, Sn, Pb, Au, Ni, Mo, W, Fe_2O_3, Al_2O_3, ZnO, BeO, CuO, Fe_3O_4, Al, NaCl, organic substances and glasses. Measurements were made of e.m.f., solubility and chemical reactions with various liquids, adsorption isotherms with CH_3OH vapour, densities, shedding volume, catalytic effects, electric resistivities, gas yield, strength, hardness, increase of size of grain as shown by microscope and X-ray spectrograph, adsorbability of dissolved dyestuffs, etc. Bibliography. [See Abstr. 1200 (1943)]. R. N.

2032 541.127 : 541.64

On the kinetics of polymerization reactions. I. First-order initiation reaction. II. Second- and combined first- and second-order initiation reactions. Mutual stabilization of growing chains. GINELL, R., AND SIMHA, R. *J. Amer. Chem. Soc.*, 65, *pp.* 706–727, *April*, 1943.—A discussion of the methods used in the treatment of polyreactions is given. A theory of chain polymerization reactions is developed which contains as parameters 3 const., the rate of creation of active nuclei, their vel. of growth, and the rate of breaking of the growing chains. The last 2 steps are assumed to be second-order reactions betw. the active chains and the stable monomer. The dependence of the course of the reaction, of the final average chain length and of the chain-length distribution upon the rate const., in particular upon the rate of initiation and upon the initial conc., is shown. The considerations are extended to second-order initiation of monomer. Second-order initiation gives rise to a product with a smaller final average mol. wt. No dependence of the final mean chain length on the initial conc. is found.

2033 541.127 : 620.19

The rate of oxidation of copper at room temperature. WHITE, A. H., AND GERMER, L. H. *Trans. Electrochem. Soc.*, 81, *pp.* 305–319, 1942.—[Abstr. 1651 B (1943)].

2034 541.127 : 620.19

The parabolic and logarithmic oxidation of copper. DIGHTON, A. L., AND MILEY, H. A. *Trans. Electrochem. Soc.*, 81, *pp.* 321–326, 1942.—[Abstr. 1652 B (1943)].

2035 541.127 : 620.19

Thin oxide films on iron. GULBRANSEN, E. A. *Trans. Electrochem. Soc.*, 81, *pp.* 327–339, 1942.—[Abstr. 1653 B (1943)].

2036 541.127 : 620.19

The rate of film formation on metals. LUSTMAN, B. *Trans. Electrochem. Soc.*, 81, *pp.* 359–375, 1942.—[Abstr. 1654 B (1943)].

2037 541.127 : 620.19

Theory of oxidation and tarnishing of metals. I. The linear, parabolic and logarithmic laws. MILEY, H. A. **II. Growth laws under more general conditions.** HAMILTON, O. H., AND MILEY, H. A. *Trans. Electrochem. Soc.*, 81, *pp.* 391–421, 1942.—[Abstr. 1655 B (1943)].

2038 541.128

Catalytic reduction by formic acid under pressure. I. The preparation of aldehydes from carboxylic acids with titanium dioxide as catalyst. DAVIES, R. R., AND HODGSON, H. H. *J. Chem. Soc.*, *pp.* 84–86, *March*, 1943.—An apparatus is described in which reduction by formic acid in the presence of catalysts has been effected under pressure and at comparatively low temperatures. With TiO_2 as catalyst, nonoic, undecenoic and lauric acids have been converted into their resp. aldehydes, whereas butyric, heptoic (trace) and phenylacetic acids failed to react. Benzoic, salicylic, *p*-sulphobenzoic and *p*-chlorobenzoic acids also gave good yields of aldehydes, but *p*-nitrobenzoic acid was mainly reduced to nitrobenzene.

2039 541.128

Application of palladium- and platinum-polyvinyl-alcohol-vanadium catalysts. RAMPINO, L. D., AND NORD, F. F. *J. Amer. Chem. Soc.*, 65, *pp.* 429–431, *March*, 1943.—Highly active Pd-PVA-V catalysts were prepared and applied to the reduction of benzaldehyde, cinnamic aldehyde, maleic acid, quinone and iodine. Experiments are presented indicating that hydrogenations with colloidal noble metal catalysts can be performed in the absence of oxygen.

See Abstr. 1898 541.128 : 536.7 : 532.782 = 3

2040 541.128 : 541.634

Disappearance of thiosulphate in solutions of maleic acid: catalysis of *cis-trans* isomerization. TAUBE, H. *J. Amer. Chem. Soc.*, 65, *pp.* 526–531, *April*, 1943.

2041 541.132

Studies on high-molecular-weight aliphatic amines and their salts. X. Ionization constants of primary and symmetrical secondary amines in aqueous solution. HOERR, C. W., MCCORKLE, M. R., AND RALSTON, A. W. *J. Amer. Chem. Soc.*, 65, *pp.* 328–329, *March*, 1943.—Ionization constants were calculated from conductivity measurements for the normal primary

aliphatic amines containing 4 to 18 C atoms, inclusive, isobutyl- and isoamylamines, docosylamine and the symmetrical normal secondary aliphatic amines containing 6, 8, 12, 13, 15 and 18 C atoms in each hydrocarbon chain. [See Abstr. 2923 (1942)].

2042 541.132

Dissociation constants and *p*H-titration curves at constant ionic strength from electrometric titrations in cells without liquid junction: titrations of formic acid and acetic acid. BATES, R. G., SIEGEL, G. L., AND ACREE, S. F. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 347–359, *May*, 1943.

2043 541.133

The conductance of aqueous solutions of magnesium perchlorate. RYSSELBERGHE, P. VAN, AND MCGEE, J. M. *J. Amer. Chem. Soc.*, 65, *pp.* 737–738, *April*, 1943.

2044 541.133.08 : 541.18

Electrolytic properties of solutions of paraffin-chain quaternary ammonium salts. SCOTT, A. B., AND TARTAR, H. V. *J. Amer. Chem. Soc.*, 65, *pp.* 692–698, *April*, 1943.—A convenient conductance cell for accurate measurement of low conc. is described. Measurements were made on aq. solutions of butyl, hexyl, octyl, decyl and dodecyltrimethylammonium bromides at 25°, 40° and 60°, and of hexadecyltrimethylammonium bromide and sodium ethyl-benzene-*p*-sulphonate at 25°. The four highest alkyl trimethylammonium bromides form micelles.

2045 541.133.08 : 541.18

Electrolytic properties of aqueous solutions of octyltrimethylammonium octanesulphonate and decyltrimethylammonium decanesulphonate. SCOTT, A. B., TARTAR, H. V., AND LINGAFELTER, E. C. *J. Amer. Chem. Soc.*, 65, *pp.* 698–701, *April*, 1943.—Conductance measurements show that these salts form slightly conducting micelles at conc. below that for corresp. single long-chain salts. The micelles bear an electric charge of the order of unity.

2046 541.133.1

The transference numbers of potassium bromide in aqueous solution at 25°C. KEENAN, A. G., AND GORDON, A. R. *J. Chem. Phys.*, 11, *pp.* 172–174, *April*, 1943.—The transf. numbers were determined by the moving-boundary method. Cells with $CdBr_2$ and LiBr as cation indicators and KIO_3 as anion indicator were employed. The results differ slightly from those previously reported [Abstr. 3994 (1935)] but are consistent with the known value of t^0_+. KBr also differs from the alkali chlorides and acetates in that the function t^0_+ is not linear in the conc.

2047 541.133.1 : 621.359 : 621.317

Principles of micro-electrophoresis cells. THOMPSON, M. R. *Trans. Electrochem. Soc.*, 81, *pp.* 147–164, 1942.—[Abstr. 1720 B (1943)].

2048 541.134 : 621.357

Studies on over-voltage. XI. Some unusual over-voltage phenomena. XII. Long-time charge and decay phenomena. FERGUSON, A. L., AND BANDES, H. *Trans. Electrochem. Soc.*, 81, *pp.* 273–303, 1942. —[See Abstr. 425 B (1940)]. Equipment is described for obtaining oscillograms of rapid changes in electrode potentials. Max. in the *IR* and cathode curves are discussed; the oscillograms show the influence of previous charge, c.d. and time of charge. The nature of the processes appears different for anode and cathode, yet for each electrode the variation with c.d. is not pronounced. A qualitative effect due to agitation of the solution is observed. Cathode over-voltage is due to more than 1 factor and the same explanation cannot apply to both anode and cathode. Breaks are observed in charge and discharge curves at approx. 1·23 V and 1·58 V, which are resp. the theoretical potential of the O-H cell and the observed decomposition potential of water.

See Abstr. 1960 541.135.5 : 537.221

2049 541.144.8

The inhibitory effect of iodine on the photolysis of gaseous hydrogen iodide. OGG, R. A., JR., AND WILLIAMS, R. R., JR. *J. Chem. Phys.*, 11, *pp.* 214–215, *April*, 1943.

See Abstr. 1902 541.18 : 531.71 : 533.723 = 3

See Abstr. 1878 541.18 : 532.13 = 3

See Abstr. 1881, 1882 541.18 : 532.773 : 532.133

See Abstr. 2044, 2045 541.18 : 541.133.08

2050 541.18.04 = 3

Investigation of ovalbumin and its products of decomposition by precipitational titration. JIRGENSONS, B. *Kolloid Z.*, 98, *pp.* 70–75, *Jan.*, 1942.—Expressions previously found for the relation betw. precipitation and conc. [Abstr. 722 (1941)] were investigated with ovalbumin, lysaltinic acids and some amino-acids at different temperatures. R. N.

See Abstr. 1965 541.182 : 537.228.3

See Abstr. 1895 541.182.4 : 532.72 = 3

See Abstr. 1871 541.183 : 531.72 = 3

2051 541.183 : 539.215.3

Hysteresis in sorption. X. Open-pore volume in relation to particle radius. RAO, K. S., AND THIRUVENKATACHAR, V. R. *Proc. Indian Acad. Sci. A*.17, *pp.* 46–49, *Feb.*, 1943.—In a system of closely packed spherical particles, formation of 2 types of capillaries —cavities and open pores—is indicated. Assuming spherical particles of equal radius, the vol. of open pores is calculated in rel. to particle radius. The total open-pore vol. decreases as the particle radius increases. The ratio of the open-pore vol. to the cavity vol. increases as particle radius increases.

2052 541.183.25 = 3

The adsorption of indicator dyestuffs to micelles of paraffin-chain salts. STAUFF, J. *Z. phys. Chem. A*, 191, *pp.* 69–94, *Aug.*, 1942.—It is proved by measurements of light absorption that the apparent change in *p*H of dyestuff indicators in colloidal aq. solutions of soaps is due to an adsorption of the dyestuff molecules to the soap micelles. This is in accordance with theory [Abstr. 304 (1940)]. The equilibrium betw. indicator molecules and the ions of the solution is described by the law of mass action. As the adsorption of the dyestuff to the micelles follows Nernst's law of distribution, the functional relation betw. the stoichiometric conc. of the micelles and the total conc. can be determined. R. N.

2053 541.24 = 3

Comparative osmotic and viscosimetric determination of mol. wt. of fractionated and non-fractionated nitrocellulose. HUSEMANN, E., AND SCHULZ, G. V.

Z. phys. Chem. B, 52, *pp.* 1–22, *July*, 1942.—The limits of error in the osmotic determination of mol. wt. and of the viscosity const. are investigated. Staudinger's const., connecting the viscosity const. with the deg. of polymerization, is given for hydrolytic and oxidation decomposition of nitrocellulose. These values refer to fractionated nitrocellulose with mol. wt. betw. 17 000 and 396 000. For non-fractionated nitrocellulose higher values of Staudinger's const. are found. The influence of non-uniformity of the preparations is discussed. [See Abstr. 2054 (1943)]. R. N.

2054 541.24 : 541.64 = 3

On the distribution of mol. wts. in decomposed celluloses and a periodical principle of composition in the cellulose molecule. SCHULZ, G. V., AND HUSEMANN, E. *Z. phys. Chem. B*, 52, *pp.* 23–49, *July*, 1942.—By fractionating and by determining the non-uniformity of preparations by comparative osmotic and viscosimetric measurements [see Abstr. 2053 (1943)] it was found that the native cellulose molecule is regularly built up with long-spaced intermediate bonds possessing a much higher speed of separation than the other β-glucoside bonds. These consist probably of xylose remnants. R. N.

2055 541.24 : 541.64 = 3

On the distribution of mol. wt. occurring with the decomposition of chain molecules with regularly spaced weaknesses. SCHULZ, G. V. *Z. phys. Chem. B*, 52, *pp.* 50–60, *July*, 1942.—Using the method previously given [Abstr. 1785 (1943)] the cellulose molecules possessing regularly spaced weaknesses [Abstr. 2054 (1943)] are theoretically investigated and a system of equations is derived characterizing the mass-distribution function. A numerical example is calculated in conformity with the exp. results. Distinct relations are found for the dependence of non-uniformity on the deg. of decomposition. R. N.

2056 541.25 : 532.612 : 532.14

Molecular volume and structure. V–VI. GIBLING, T. W. *J. Chem. Soc.*, *pp.* 146–153, *April*, 1943.—[See Abstr. 769 (1943)]. The parachors of the simpler organic compounds containing nitro-, nitrito-, azo-, diazo-, triazo-, cyano-, and *iso*cyano-groups are considered; group values are calculated, certain peculiarities of structure discussed, and the necessary interference corrections assessed. The polarity of the molecules of alkyl cyanides appears to produce an effect similar to that already observed in the case of carbonyl compounds.—The parachors of hydroxy-compounds, amines, alkyl halides and compounds containing ethereal O atoms are discussed. For those substances which are associated at room temperature—alcohols and phenols, primary and secondary amines—parachors are estimated for the same substances existing as single molecules. The configuration of a carbon chain is determined primarily by the polarity of that part of the molecule to which it is attached.

See Abstr. 1984 541.56 : 539.132

See Abstr. 1941 541.57 : 535.375.5

See Abstr. 1985 541.57 : 539.133

2057 541.61

On the structure of $Mo(CN)_8^{-4}$. RACAH, G. *J. Chem. Phys.*, 11, *p.* 214, *April*, 1943.

2058 541.63

The stereochemistry of co-ordination number eight. MARCHI, L. E., FERNELIUS, W. C., AND MCREYNOLDS, J. P. *J. Amer. Chem. Soc.*, 65, *pp.* 329–333, *March*, 1943.—Complete isomer tables for monodentate and partial isomer tables for bidentate groups for 4 likely configurations for compounds of elements exhibiting co-ordination number 8—the cube, the square Archimedean antiprism, a dodecahedron with triangular faces and symmetry V_d and a trigonal prism with 2 extra bonds along the unique axis—are developed.

See Abstr. 2040 541.634 : 541.128

See Abstr. 2032 541.64 : 541.127

See Abstr. 2054, 2055 541.64 : 541.24 = 3

See Abstr. 1938 541.653 : 535.515 : 535.347

See Abstr. 1944 541.653 : 535.563

2059 541.653.3

The mutarotation of β-D-altrose. RICHTMYER, N. K., AND HUDSON, C. S. *J. Amer. Chem. Soc.*, 65, *pp.* 740–741, *April*, 1943.

See Abstr. 2025 541.68 : 539.62

2060 542.44

An electrically heated melting-point apparatus. DOWZARD, E., AND RUSSO, M. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 219–221, *March* 15, 1943.

CRYSTALLOGRAPHY

2061 548 : 535.6

The cause of the variation of the colour of crystals of commercial sodium and potassium ferrocyanide [cyanoferrate(II)]. WILLIAMS, H. E. *J. Chem. Soc.*, *pp.* 223–227, *May*, 1943.—The results of experiments on the action of light, heat and air on solutions of the ferrocyanides, acid, alkaline and neutral, together with suggestions for the reactions taking place in the formation of pentacyanoaquoferrate-(II) and -(III) and ferricyanide [cyanoferrate(III)] are recorded. The amber-coloured crystals in commercial ferrocyanide are caused by traces of colloidal ferric hydroxide.

See Abstr. 2009 548 : 669.25 : 539.26

2062 548.1 : 512.831

The mathematics of the physical properties of crystals. BOND, W. L. *Bell Syst. Techn. J.*, 22, *pp.* 1–72, *Jan.*, 1943.—Discusses the application of matrix algebra to the study of the electric, elastic, thermal and optical properties of crystals, with particular ref. to the use of crystals in electric circuits. J. T.

See Abstr. 1997 548.5 : 536.7 : 536.421 : 539.2

2063 548.73

The crystal structure of 4 : 4′-dinitrodiphenyl [$C_{12}H_8(NO_2)_2$]. NIEKERK, J. N. VAN. *Proc. Roy. Soc. A*, 181, *pp.* 314–329, *May* 6, 1943.—The method of double Fourier series is applied, and projections of the electron density on 2 of the axial planes is made. The projection on the *bc* plane has no centre of symmetry and the phases of the Fourier components had to be estimated before summing the series. The benzene rings are regular hexagons of side 1·41 Å, the two rings in the molecule being co-planar with a common axis. The C–C link betw. rings is 1·42 Å. The C–N links make angles of about $\pm$ 22° with the

ring plane. The two N–O distances in the nitro-group are 1·14 and 1·21 Å, the O–O distance being 2·00 Å.

2064 548.73 : 621.386.1

X-ray crystal analysis. *Metal Ind., Lond., pp.* 290–292, *May* 7, 1943.—[Abstr. 1777 B (1943)].

See Abstr. 2007 548.73 : 669.71 : 539.4.016 : 539.26

GEOPHYSICS

2065 550

Geophysical Laboratory. ADAMS, L. H. *Carnegie Instn Yearb.*, 41, *pp.* 29–37, 1941–1942.—Programme of defence research.

2066 550.312 : 550.38

Gravity and magnetic calculations. NETTLETON, L. L. *Geophysics*, 7, *pp.* 293–310, *July*, 1942.—The disturbances produced in gravitational (or magnetic) fields by sub-surface masses (or vertically magnetized bodies) of simple geometric shapes are calculated. The results, which are presented both analytically and graphically, are given in generalized dimensionless forms from which sp. cases can be calculated. Most disturbances can be well enough represented by one or other of the geometric forms considered for the data to be sufficient in interpreting reconnaissance surveys. A. HU.

2067 550.34(794)

Co-operative researches at the Seismological Laboratory. *Carnegie Instn Yearb.*, 41, *pp.* 102–106, 1941–1942.—Research programme at Pasadena.

2068 550.341

A mechanical device for computing seismic paths. WOLF, A. *Geophysics*, 7, *pp.* 61–68, *Jan.*, 1942.—In a medium in which the wave velocity varies linearly with depth, the wave paths and the wave fronts are circles, and the transit time betw. any 2 points can be expressed as a simple function of 2 angles. A mechanical device is described for the computation of the circular paths. A. HU.

2069 550.341

Earthquake magnitude, intensity, energy and acceleration. GUTENBERG, B., AND RICHTER, C. F. *Bull. Seism. Soc. Amer.*, 32, *pp.* 163–191, *July*, 1942.—The principal physical elements of an earthquake are related empirically to the depth and radius of perceptibility of the shock. The instrumental magnitude scale is extended to cover short distances, and a relation is established betw. the magnitude and the epicentral intensity for Californian shocks. The results will hold in other regions of similar structure for shocks occurring at the same depth. A general equation is developed for the energy of an earthquake, assuming sinusoidal waves travelling at const. velocity and suffering no absorption. The results are used to calculate the apparent depths of shocks in the U.S. and in Europe. It is confirmed that Pacific Coast earthquakes are of relatively shallow origin. A. HU.

2070 550.346

A method of calculating the dynamic force on a building during an earthquake. WHITE, M. P. *Bull. Seism. Soc. Amer.*, 32, *pp.* 193–203, *July*, 1942.—Treating a building as a linear elastic system with linear damping, and confining the treatment to structures with 2 planes of symmetry, the author finds the response to the earthquake component being investigated. Details are given of a numerical method of solving the differential equation of motion of the system, both for damped and for undamped oscillations, and 2 illustrative examples are fully discussed. A. HU.

See Abstr. 2066 550.38 : 550.312

2071 550.381

The mutual consistency of successive monthly means of declination, Huancayo Magnetic Observatory. SCOTT, W. E. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 45–48, *March*, 1943.

2072 550.381

Department of Terrestrial Magnetism. FLEMING, J. A. *Carnegie Instn Yearb.*, 41, *pp.* 39–86, *July* 1, 1941–*June* 30, 1942.—Progress report.

2073 550.384

Vector diagrams of annual variation of magnetic activity in declination and horizontal intensity, Oslo, 1843–1886. WASSERFALL, K. F. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 41–43, *March*, 1943.

2074 550.384 : 523.746

Solar and magnetic data, October to December, 1942, Mount Wilson Observatory. NICHOLSON, S. B., AND MULDERS, E. S. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 17–18, *March*, 1943.

2075 550.385

Principal magnetic storms. October to December, 1942. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 64–65, *March*, 1943.

2076 550.389

American magnetic character-figure, C_A, three-hour-range indices, K, and mean K-indices, K_A, for October to December, 1942, and Summary for year 1942. JOHNSTON, H. F. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 19–27, *March*, 1943.

2077 550.831 + 550.838

Gravity and magnetic observations on Iron Mountain magnetite deposit, Llano County, Texas. BARNES, V. E., AND ROMBERG, F. *Geophysics*, 8, *pp.* 32–44, *Jan.*, 1943.—An outcrop of magnetite in the Central Mineral region of Texas is explored experimentally with a dip needle and a gravity meter. Two anomalies are observed, one due to the outcropping body and one probably due to a previously unknown body close to the outcrop. The possible attitudes of the bodies are discussed, and their masses and probable dimensions are computed from the gravitational observations.

2078 550.831

Determination of the Bouguer correction constant. SIEGERT, A. J. F. *Geophysics*, 7, *pp.* 29–34, *Jan.*, 1942.—The correction for elevation differences in gravimetric surveying is determined by a new method which eliminates some graphical work and all personal judgment. The correction const. is calculated by making the corrected gravity profile as smooth as possible, and a sample computation shows that this is equivalent to eliminating the correlation betw. corrected gravity and elevation. A. HU.

2079 550.831

Simplification of tidal corrections for gravity meter surveys. ADLER, J. L. *Geophysics*, 7, *pp.* 35–44, *Jan.*,

1942.—A rapid, practical method of computing the effect of lunar and solar tidal forces on the vertical component of gravity is outlined. For routine gravimetric work a chart is developed from which the tidal correction for any U.S. observation can be obtained directly in < 1 min. with an average error of $< 0{\cdot}01$ milligal. A. HU.

2080 550.831

The value of quantitative interpretation of gravity data. SKEELS, D. C. *Geophysics*, 7, *pp.* 345–353, *Oct.*, 1942.—In general, no unique interpretation exists of a given set of gravity data. Where supplementary geological data are known, however, or where the shape of the gravity anomaly limits the range of possible solutions, it is contended that a single consistent sub-surface distribution of mass can be deduced for use as a working hypothesis. Three illustrative examples of elongated anomalies are discussed. A. HU.

2081 550.831(761)

Gravity expression of the Hatchetigbee Anticline. MCCOLLUM, E. V. *Geophysics*, 8, *pp.* 46–56, *Jan.*, 1943.—A reconnaissance gravity survey is presented of the Hatchetigbee Area of S.W. Alabama, which discloses 2 min. associated with the Hatchetigbee Anticline and the neighbouring Jackson Fault. A study of the gravity data, together with geologic and magnetic information, leads to the possibility that a salt ridge exists in the general Hatchetigbee Area, and that the gravity min. represent individual salt domes.

2082 550.834(762)

Seismograph evidence on the depth of the salt in Southern Mississippi. SWARTZ, C. A. *Geophysics*, 8, *pp.* 1–2, *Jan.*, 1943.—Reflection seismograph records shot over the tops of shallow salt domes in S. Mississippi show deep events which can reasonably be identified as reflections from the base of the salt. Calculations reveal the depth to the bottom of the salt mass to be approx. 22 000 to 26 000 ft.

2083 550.834(764)

Local areal distribution of velocities in the Texas Gulf Coast. SWAN, B. G. *Geophysics*, 7, *pp.* 367–392, *Oct.*, 1942.—The paper presents velocity data obtained from long reversed-profile surface shooting on 3 Texas Gulf Coast projects. Velocity determinations were distributed areally in sufficient detail to permit construction of contour maps representing velocities to a time datum. Maps are presented showing the resulting corrected seismic structure. Time/depth curves of 2 profiles with curves of nearby well velocity surveys are given.

2084 550.834(767)

An application of seismic surveying to the location of bauxite in Arkansas. GILLIN, J. A., SHOCK, L., AND ALCOCK, E. D. *Geophysics*, 7, *pp.* 400–405, *Oct.*, 1942.—The geology of the formation of bauxite in Arkansas is closely related to the syenite exposures on the old land surface at the end of Midway time. A refraction seismic survey mapped the attitude of the high-velocity formations identified as syenite or Paleozoic rocks. By combining this map with a map of the Midway from scattered core holes, a map of the old land surface at the end of Midway time was obtained.

2085 550.834.5

An analysis of abnormal reflections. DEACON, L. E. *Geophysics*, 8, *pp.* 3–13, *Jan.*, 1943.—During the course of a reflection survey of an area in S.W. Texas, a group of seismograms was obtained on which were recorded a number of events having abnormal apparent velocities. The dips computed from these events on the assumption that they were conventional reflections in the plane of the profile were larger than the anticipated stratigraphic dip. The paper presents a discussion of the origins of these events and an analysis which affords evidence that they originated on fault planes.

2086 550.837

The effect of mud resistivities on the intensities of electrical logs. BOWSKY, M. C. *Geophysics*, 7, *pp.* 82–89, *Jan.*, 1942.

2087 550.837.3(789)

A resistivity survey of the Monument oil field. ENGLAND, C. M. *Geophysics*, 8, *pp.* 14–22, *Jan.*, 1943.—Describes an electrical-resistivity survey made of an area in New Mexico. From the data obtained, a map showing the structure at the base of the Red Beds was prepared which agrees with structure disclosed by wells later drilled.

See Abstr. 2077 550.838 + 550.831

2088 551.24

Test of a quantitative mountain-building theory by Appalachian structural dimensions. ELKINS, T. A. *Geophysics*, 7, *pp.* 45–60, *Jan.*, 1942.—The paper applies various formulae [Abstr. 3966 (1937)] to the calculation of width and amplitude of folds, to basin widths and depths, and to mountain heights of the Appalachian Mountain system. A brief discussion is given of the theoretical interpretation of the large isostatic gravity anomaly as due to possible crustal stress.

2089 551.5 : 016

On international bibliographies of meteorology. MULLER, H. *Bull. Amer. Met. Soc.*, 23, *pp.* 407–410, *Dec.*, 1942.

2090 551.51 = 3

Thunderstorm-warning service and observations at the North-Eastern Swiss Electricity Supply Company, Baden. ZOBRIST, W. *Bull. Ass. Suisse Élect.*, 34, *pp.* 46–49, *Jan.* 27, 1943.—The thunderstorm recording service [see also Abstr. 1560 B (1943)] which was initiated by the Baden Electricity Supply Company 10 years ago is described. It is shown how the records obtained permit to warn station engineers of an approaching storm and enable them to take the necessary precautions. Typical movements of storms across the region covered are described and the main storm tracks are plotted. Statistical data are given on the storm frequency and the number of line disturbances. R. H. G.

See Abstr. 2095 551.510.42 : 551.594.18

2091 551.510.535 : 523.745 : 621.396.821

Effects of solar activity on the ionosphere and radio communications. WELLS, H. W. *Proc. Inst. Radio Engrs, N.Y.*, 31, *pp.* 147–157, *April*, 1943.—[Abstr. 1799 B (1943)].

2092 551.513.1

Refinement of Brooks' "Simplification of the Acceleration Potential." WALSH, J. E., JR. *Bull. Amer. Met. Soc.*, 23, *pp.* 411–412, *Dec.*, 1942.

2093 551.543.1 : 523.746

Solar disturbances and interdiurnal variations of atmospheric pressure. HUNTINGTON, E. *Bull. Amer. Met. Soc.*, 23, *pp.* 388–399, *Dec.*, 1942.—Interdiurnal variability of atm. pressure at New Haven shows a significant correlation with the position of sunspots on the disc of the sun as seen from the earth. The correlation indicates a double annual cycle in which high lat. of spots is associated with high barometric variability in summer and winter at about the time of the solstices and with low barometric variability in the spring and fall near the time when one or the other axis of the sun points most nearly to the earth.

2094 551.582.1(728.1)

Studies in Guatemalan meteorology. II. MCBRYDE, F. W. *Bull. Amer. Met. Soc.*, 23, *pp.* 400–406, *Dec.*, 1942.

2095 551.594.18 : 551.510.42

Effect of smoke on the atmospheric-electric elements at the Watheroo Magnetic Observatory. WAIT, G. R. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 49–63, *March*, 1943.—Intense smoke increases the total resistance of the vertical column of air over the station. This and other evidence indicate that the smoke extends to a height of about 1 km. The resistance varies greatly through the day. Both the variation and the average value are increased by smoke. Factors other than the number of condensation nuclei and radioactive matter in the atmosphere may be effective in producing a diurnal variation. The intensity of smoke at Watheroo appears to be independent of the direction and velocity of the wind. The rate of ionization in the lower atmosphere over a station on land is greatest during the morning hours and least during the evening. The cause for the variation appears to be a change in the amount of radioactive matter.

2096 551.594.221

Magnitudes of lightning currents. GOLDE, R. H. *Nature, Lond.*, 151, *p.* 421, *April* 10, 1943.

2097 551.594.25

The separation of electricity in clouds. SIMPSON, G. C. *Phil. Mag.*, 34, *pp.* 285–287, *April*, 1943.—[See Abstr. 1283 (1943)].

2098 551.594.5 : 523.752 = 3

The aurorae of 25 Jan. 1938 and 18 Sept. 1941 and their solar origin. WALDMEIER, M. *Vjschr. naturf. Ges. Zürich*, 87, *pp.* 253–267, 1942.—Detailed descriptions are given of the structure of these auroral displays as observed in Switzerland. The 1941 aurora was photographed, 18 one-min. exposures being secured with an *f*/3·5 lens at different azimuths in a period of 3 hr. Two systems of parallel rays inclined at 8° to one another are distinguished. A microphotometer trace is shown of a spectrogram secured in 8 hr. on an *f*/1 quartz spectrograph. German and Dutch magnetic traces show large deflections in *H* and *D* which occurred simultaneously with outbreaks of luminosity in the 1938 aurora, but the 1941 auroral intensity showed no such correspondence with Swiss magnetic records. Both aurorae are ascribed to chromospheric eruptions emitting particles at speeds of from 2 000 to 750 km./sec. A. HU.

VARIOUS SUBJECTS

See Abstr. 1963	553.983 : 537.226.2 = 3
See Abstr. 1949	611.8 : 535.733.1
See Abstr. 2003	661.713 : 539.216.1
See Abstr. 2031	669 : 541.124 = 3
See Abstr. 2009	669.25 : 548 : 539.26
See Abstr. 2007	669.71 : 539.4.016 : 548.73 : 539.26
See Abstr. 2004	676.1 : 539.216.1
See Abstr. 1959	677 : 537.22
See Abstr. 1861	678 : 53
See Abstr. 2018	678 : 539.388.8 = 3
See Abstr. 2024	678 : 539.56
See Abstr. 2023	679.5 : 537.311.32 : 539.501 = 3
See Abstr. 1998	679.5 : 539.214.07
See Abstr. 2022	679.5 : 539.434
See Abstr. 1907	681.818 : 534.322

2099 681.84

The Synchrophone method of audio-visual instruction. *Engineering*, 155, *pp.* 157–158, *Feb.* 19, 1943.—[Abstr. 1807 B (1943)].

2100 771.37 : 621.397.6

The focusing view-finder problem in television cameras. BEERS, G. L. *Proc. Inst. Radio Engrs, N.Y.*, 31, *pp.* 100–106, *March*, 1943.—[Abstr. 1802 B (1943)].

2101 778.3 : 621.3.015.3 : 621.317.351

The photography of high-speed transient phenomena with the sealed-off glass-tube cathode-ray oscillograph. NETHERCOT, W., AND BEATTIE, H. *J. Sci. Instrum.*, 20, *pp.* 75–76, *May*, 1943.—[Abstr. 1725 B (1943)].